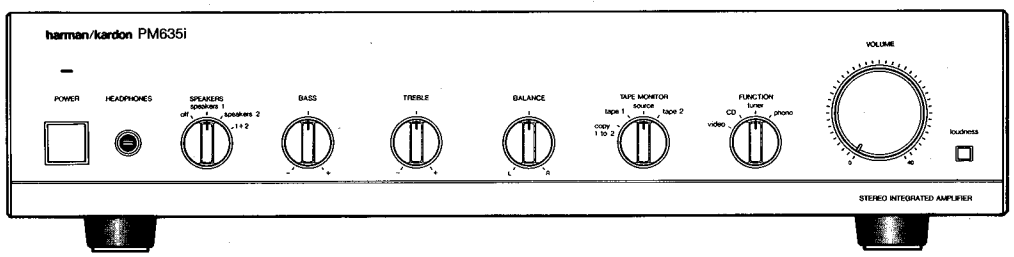
The Harman Kardon Model PM635i

Manual 137A

STEREO INTEGRATED AMPLIFIER

Technical Manual



The following marks found in the parts list of this manual identify the models as follows.

- (BK) : North America area model Black version
- (GB) : General model Black version
- (NB) : Japan model Black version

harman/kardon
240 Crossways Park West, Woodbury, N.Y. 11797
1112-3152137A0 P-088807 1500 Printed in Japan

PM635i

SPECIFICATIONS

	Nominal	Limit
RMS Output Power		
8Ω, 1kHz THD 0.1%	35W	≧30W
High Instantaneous Current Capability (HCC)	20.8A	≧15A
Half Power Bandwidth	10Hz ~ 100kHz	
Frequency Responce at −3dB	0.6Hz ~ 178kHz	
Input Sensitivity		
Tuner	135mV	± 25mV
Phono	2.2mV	$^{+0.4}_{-0.2}$mV
Signal to Noise Ratio		
Tuner	85.5dB	≧75dB
Phono	80.0dB	≧73dB
Channel Separation at 10kHz		
Tuner	55dB	≧45dB
Phono	55dB	≧45dB
IM Distortion Ratio	0.05%	≦0.1%
Damping Factor at 1kHz	70	≧50
Tone Control Characteristics		
Bass Turnover Frequency (200Hz/400Hz)		
Bass at 50Hz/100Hz		
Boost	10dB	± 2dB
Cut	10dB	± 2dB
Treble Turnover Frequency (2kHz/6kHz)		
Treble at 10kHz/30kHz		
Boost	10dB	± 2dB
Cut	10dB	± 2dB

	Nominal	Limit
Loudness Control (with Volume Control at −40dB)		
at 10kHz	3dB	± 1dB
at 50Hz	10dB	± 2dB
DC Output Voltage		
L channel	0mV	± 60mV
R channel	0mV	± 60mV
RIAA Equalization at Tape Out (20Hz/20kHz) (No load)	0.12dB + 0.5dB/0.12dB-0.5dB	
Phono Over Load (No load)		
Phono	110mV	≧95mV
Dimensions (W × H × D)	17-1/2" × 4-1/16" × 13-7/8" (443 × 103 × 353mm)	
Weight		
North America area model	12 lbs. 12oz. (5.8kg)	
General model	14 lbs. 1oz. (6.4kg)	
Japan model	13 lbs. 10oz. (6.2kg)	
Power Supplies		
North America area model	AC 120V, 60Hz	
General model	AC 220/240V, 50/60Hz	
Japan model	AC 100V, 50/60Hz	
Power Consumption		
North America area model	220W (242VA)	
General model	190W	
Japan model	98W	

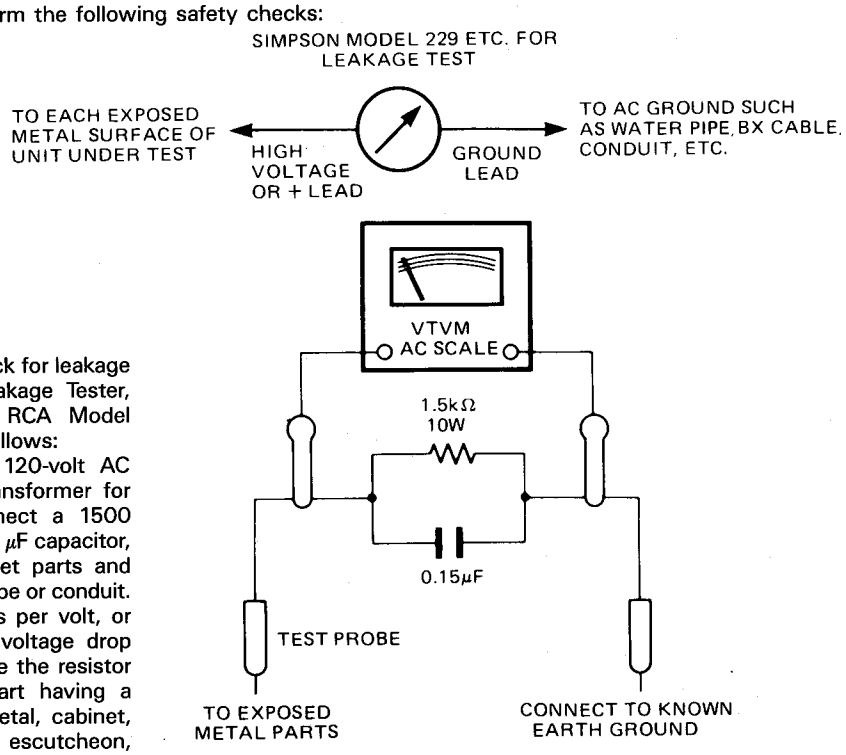
These specifications are service target specs.

Specifications and components subject to change without notice. Overall performance will be maintained or improved.

LEAKAGE TEST (FOR SERVICE ENGINEERS IN THE U.S.A.)

Before returning the unit to the user, perform the following safety checks:

1. Inspect all lead dress to make certain that leads are not pinched or that hardware is not lodged between the chassis and other metal parts in the unit.
2. Be sure that any protective devices such as nonmetallic control knobs, insulating fishpapers, cabinet backs, adjustment and compartment covers or shields, isolation resistor-capacity networks, mechanical insulators, etc. which were removed for servicing are properly reinstalled.
3. Be sure that no shock hazard exists; check for leakage current using Simpson Model 229 Leakage Tester, standard equipment item No. 21641, RCA Model WT540A or use alternate method as follows:
   Plug the power cord directly into a 120-volt AC receptacle (do not use an Isolation Transformer for this test). Using two clip leads, connect a 1500 Ohm, 10-watt resistor paralleled by a 0.15 μF capacitor, in series with all exposed metal cabinet parts and a known earth ground, such as a water pipe or conduit. Use a VTVM or VOM with 1000 Ohms per volt, or higher sensitivity to measure the AC voltage drop across the resistor. (See Diagram.) Move the resistor connection to each exposed metal part having a return path to the chassis (antenna, metal, cabinet, screw heads, knobs and control shafts, escutcheon, etc.) and measure the AC voltage drop across the resistor. (This test should be performed with the power switch in both the On and Off positions.)
   A reading of 0.35 volt RMS or more is excessive and indicates a potential shock hazard which must be corrected before returning the unit to the owner.


SIMPSON MODEL 229 ETC. FOR LEAKAGE TEST
TO EACH EXPOSED METAL SURFACE OF UNIT UNDER TEST
HIGH VOLTAGE OR + LEAD
GROUND LEAD
TO AC GROUND SUCH AS WATER PIPE, BX CABLE, CONDUIT, ETC.
VTVM AC SCALE
1.5kΩ 10W
0.15μF
TEST PROBE
TO EXPOSED METAL PARTS
CONNECT TO KNOWN EARTH GROUND

DISASSEMBLY PROCEDURES (REFER TO PAGES 5 AND 14)

1 CABINET TOP REMOVAL
Remove 6 screws (A) and then remove the Cabinet Top (131).

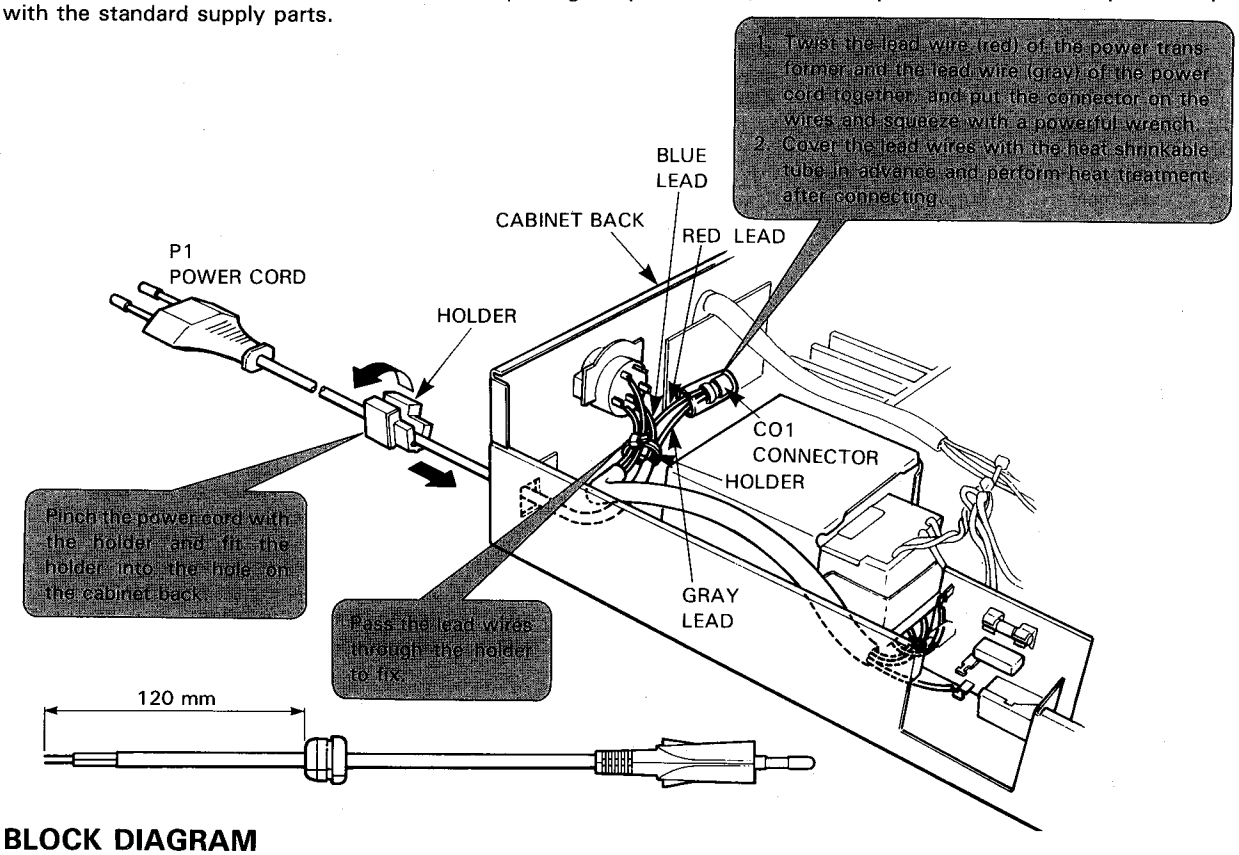
2 FRONT PANEL ASS'Y (AA) REMOVAL
1. Remove the Cabinet Top (131), referring to the previous step 1.
2. Pull out 6 Rotary Knob (152) and Volume Rotary Knob (150).
3. Remove 5 screws (B) and then Front Panel Ass'y (AA).

3 MAIN P. C. BOARD (PCB-1) REMOVAL
1. Remove the Front Panel Ass'y (AA), referring to the previous step 2.
2. Open the lid of connector (CN106) on the Main P. C. Board (PCB-1).
3. Remove 6 hexagon nuts (C) and then remove the Speaker Switch, VR (PCB-5, PCB-7).
4. Remove 4 screws (D) and then remove the Main P. C. Board (PCB-1).
   If necessarry, unsolder the lead wires.

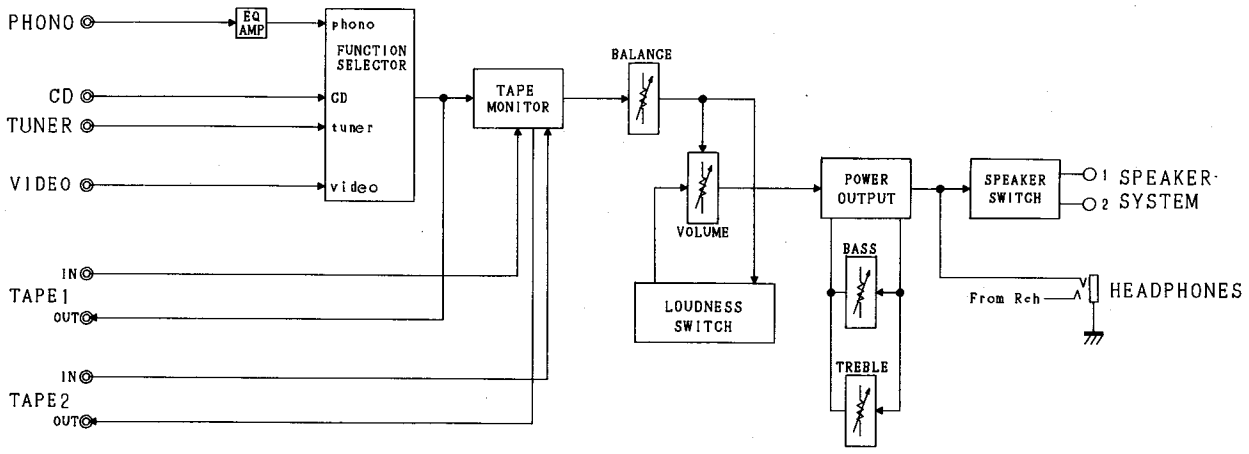
4 EQUALIZER P. C. BOARD (PCB-11) REMOVAL
1. Remove the Cabinet Top (131), referring to the previous step 1.
2. Remove 5 screws (H) and then remove the Equalizer P. C. Board (PCB-11).
   If necessory, unsolder the lead wires.

POWER CORD REPLACEMENT (FOR SERVICE ENGINEERS OTHER THAN NOTRH AMERICA)

In order to prevent fire or shock hazard when replacing the power cord, follow the procedure below to replace the parts with the standard supply parts.


1. Twist the lead wire (red) of the power transformer and the lead wire (gray) of the power cord together, and put the connector on the wires and squeeze with a powerful wrench.
2. Cover the lead wires with the heat shrinkable tube in advance, and perform heat treatment after connecting.
BLUE LEAD
CABINET BACK
RED LEAD
P1
POWER CORD
HOLDER
CO1
CONNECTOR
HOLDER
GRAY LEAD
Pinch the power cord with the holder and fit the holder into the hole on the cabinet back.
Pass the lead wires through the holder to fix.
120 mm

BLOCK DIAGRAM



ALIGNMENT PROCEDURES (REFER TO PAGES 6, 7 AND 12)

Conditions:
- Set the Volume control to minimum.
- Set the Speaker selector to "1 + 2" position.
- Make the adjustment at a room temperature of 77°F (25°C).
- After the Power switch is pushed on, wait for 30 minutes before measuring to be sure of the most stable operation.

■ IDLING CURRENT ADJUSTMENT

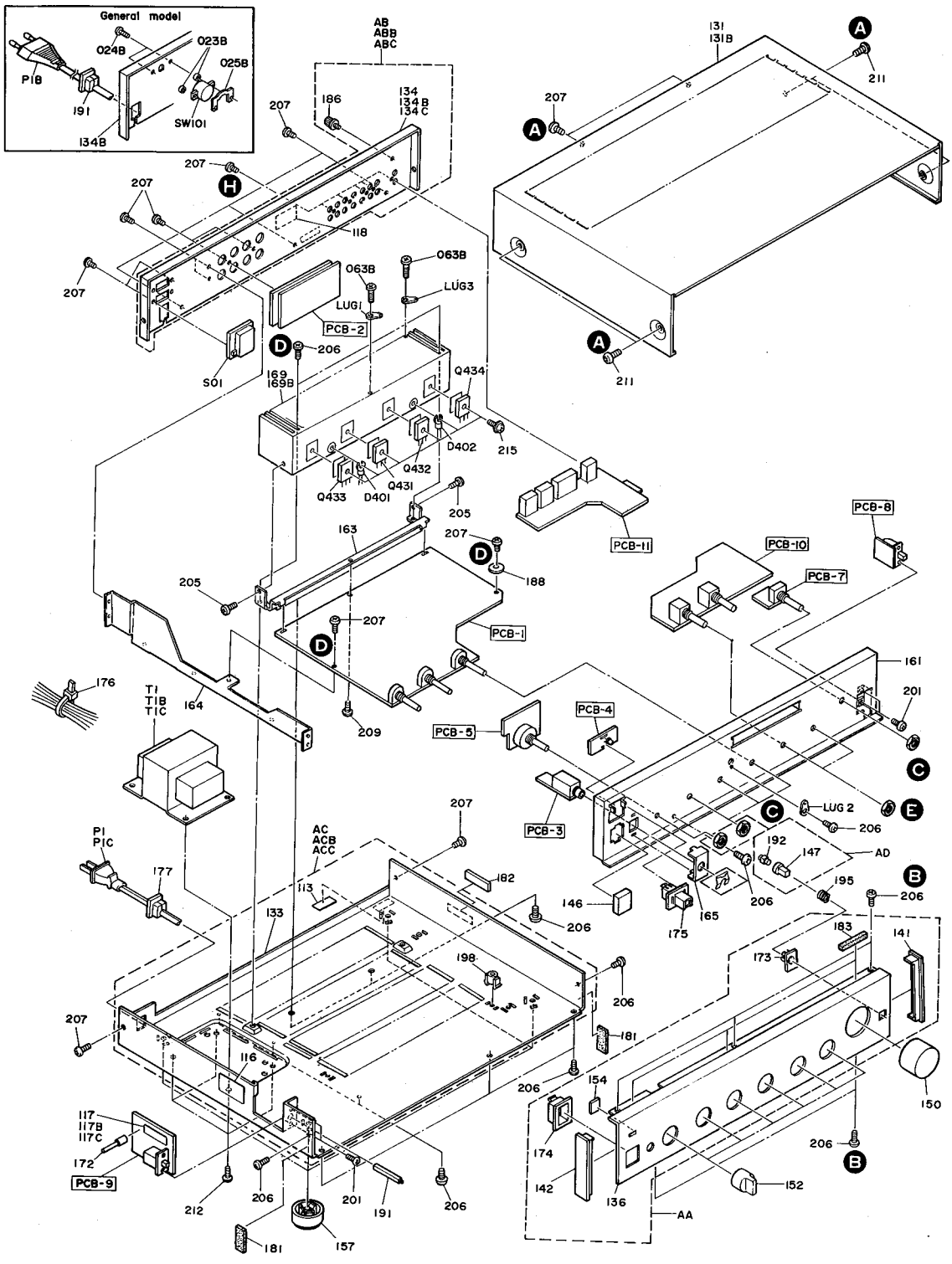
Step	Connection Equipments	Adjustment	For
1	Connect the Digital Volt Meter to TP1 and TP2.	VR401 (L ch)	40mV ±2mV
2	Connect the Digital Volt Meter to TP3 and TP4.	VR402 (R ch)	40mV ±2mV

PARTS LIST

Ref. No.	Part No.	Description
AA	A443-PM635IA	FRONT PANEL ASS'Y
AB	A424-PM635IA	CABINET BACK ASS'Y (BK)
ABB	A424-PM635IC	CABINET BACK ASS'Y (GB)
ABC	A424-PM635IE	CABINET BACK ASS'Y (NB)
AC	A424-PM635IB	CABINET BOTTOM ASS'Y (BK)
ACB	A424-PM635ID	CABINET BOTTOM ASS'Y (GB)
ACC	A424-PM635IF	CABINET BOTTOM ASS'Y (NB)
AD	A662-PM635IA	PUSH BUTTON ASS'Y
023B	2132-7116	SPACER (GB)
024B	2327-R0130124	SCREW, BND+ (GB)
025B	2440-7017	NUT, SPE (GB)
052B	4443-721	CONNECTOR (GB)
053B	4150-8	TUBING, SPE (GB)
063B	2347-R0130084	SCREW, BND T+ MAIN (GB)
113	1117-78	SERIAL LABEL, BOTTOM
116	1756-05910	LABEL (BK)
117	1756-01426	LABEL, FUSE (2.5A)
117B	1756-01402	LABEL, FUSE (GB)
117C	1756-01436	LABEL, FUSE (NB)
118	1756-CSA	LABEL, CSA (BK)
131	1414-11501	CABINET TOP
131B	1414-04901	CABINET TOP (GB)
133	1424-27101	CABI BACK, BOTTOM
134	1424-27001	CABI BACK, REAR
134B	1424-27003	CABI BACK, REAR (GB)
134C	1424-27002	CABI BACK, REAR (NB)
136	1443-12701	PANEL, FRONT
141	1562-02802	FRAME, R-SIDE
142	1562-02702	FRAME, L-SIDE
146	1660-00403	PUSH BUTTON, POWER
147	1662-05702	PUSH BUTTON, LOUDNESS
150	1630-02603	ROTARY KNOB, VOLUME
152	1632-17101	ROTARY KNOB
154	1732-05801	INDICATOR, LED
157	1319-0139	LEG, BOTTOM
161	2211-7295	CHASSIS, FRONT
163	2219-8179	METAL FITTING
164	2219-8207	METAL FITTING, BOTTOM
165	2219-7879	METAL FITTING, H/P
169	2222-7232	HEAT SINK, MAIN
169B	2222-7252	HEAT SINK, MAIN (GB)
172	2240-7320	HOLDER, POWER
173	2240-7202	HOLDER, LOUDNESS
174	2240-7209	HOLDER, POWER
175	2240-7349	HOLDER, LED
176	2240-7120	HOLDER, WIRING
177	2240-364	HOLDER, AC
181	2112-11768	SPONGE, FRONT
182	2112-11771	SPONGE, REAR
183	2112-11762	SPONGE, PANEL
186	4214-168	TERMINAL (GND)
188	2402-0374	WASHER, PLSTC BOSS

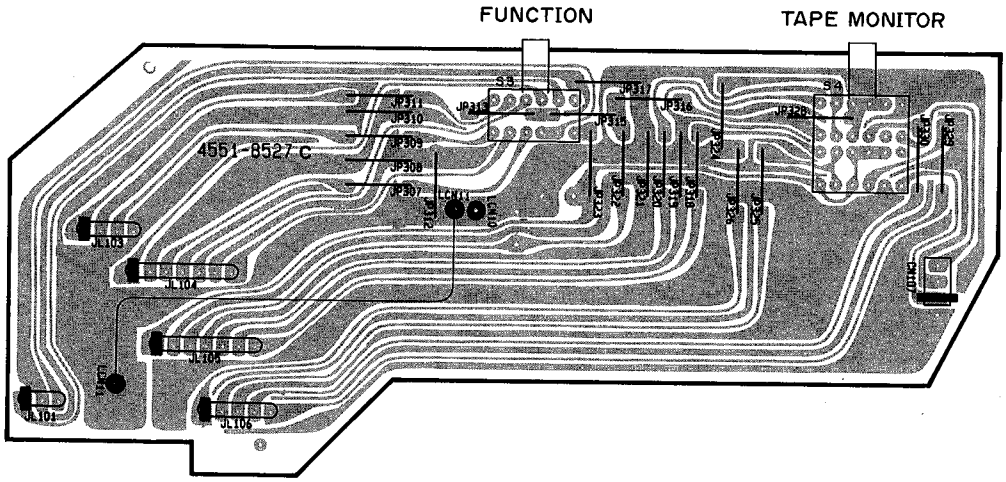
Ref. No.	Part No.	Description
191	2672-7018	LEVER
192	2601-7077	SHAFT, LOUDNESS
195	2651-210189	SPRING
198	2360-7015	BOSS, SPE BOTTOM
201	2327-R0130064	SCREW, BND+
205	2347-R0130062	SCREW, BND T+
206	2347-R0130062	SCREW, BND T+
207	2347-R0130084	SCREW, BND T+
209	2347-R0130102	SCREW, BND T+ MAIN
211	2347-R0140064	SCREW, BND T+ TOP
212	2347-400827	SCREW, BND T+ TRANS
215	2557-301029	SCREW, B SPW+
⚠PI	4161-71151	CORD W/PLUG
⚠PIB	4161-7256	CORD W/PLUG (GB)
⚠PIC	4161-00401192	CORD W/PLUG (NB)
⚠TI	5584-701526	XFORMER, POWER
⚠TIB	5584-S2503	XFORMER, POWER (GB)
⚠TIC	5584-S2504	XFORMER, POWER (NB)
⚠SOI	4474-227	SOCKET (BK) (NB)
LUGI	4211-4	LUG (GB)
LUG2	4211-4	LUG
LUG3	4211-4	LUG (GB)
⚠SWI01	4411-102729	SWITCH, ROTARY (GB)
Q431	5613-3181(O) or (R)	XISTOR, NPN R
Q432	5613-3181(O) or (R)	XISTOR, NPN R
Q433	5611-1264(O) or (R)	XISTOR, PNP R
Q434	5611-1264(O) or (R)	XISTOR, PNP R
D401	5641-MV12YM	VARISTOR
D402	5641-MV12YM	VARISTOR

GENERAL UNIT
EXPLODED VIEW

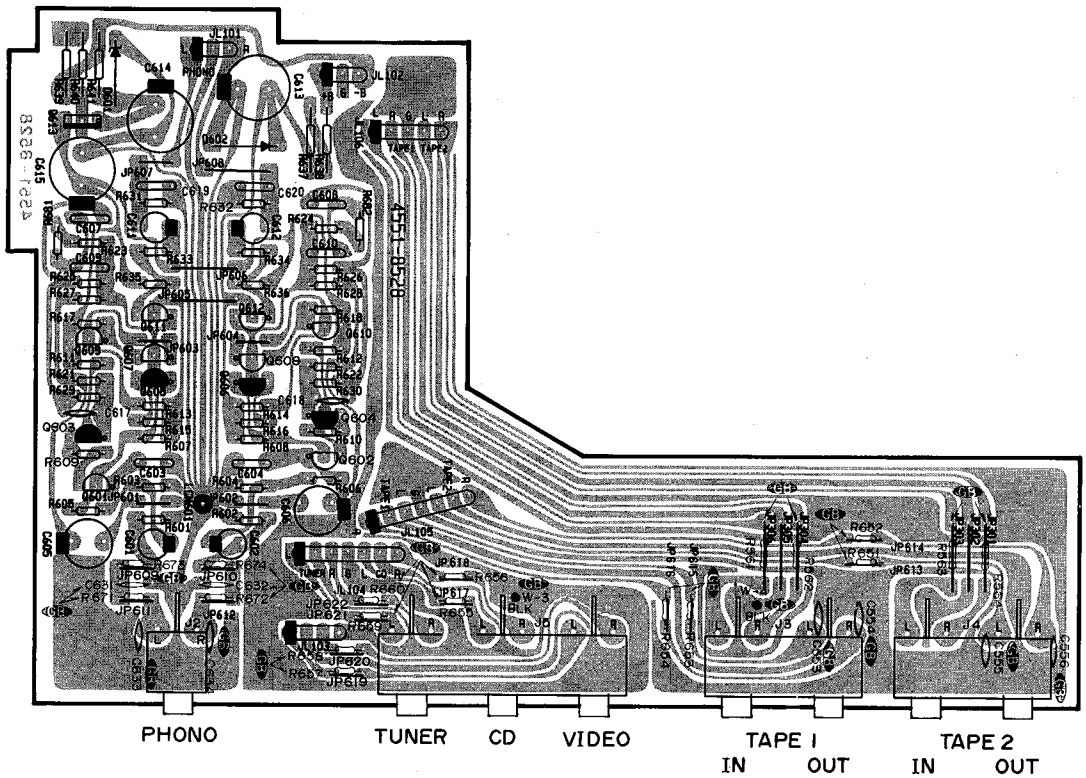


P. C. BOARDS

PCB-10 Function P. C. Board

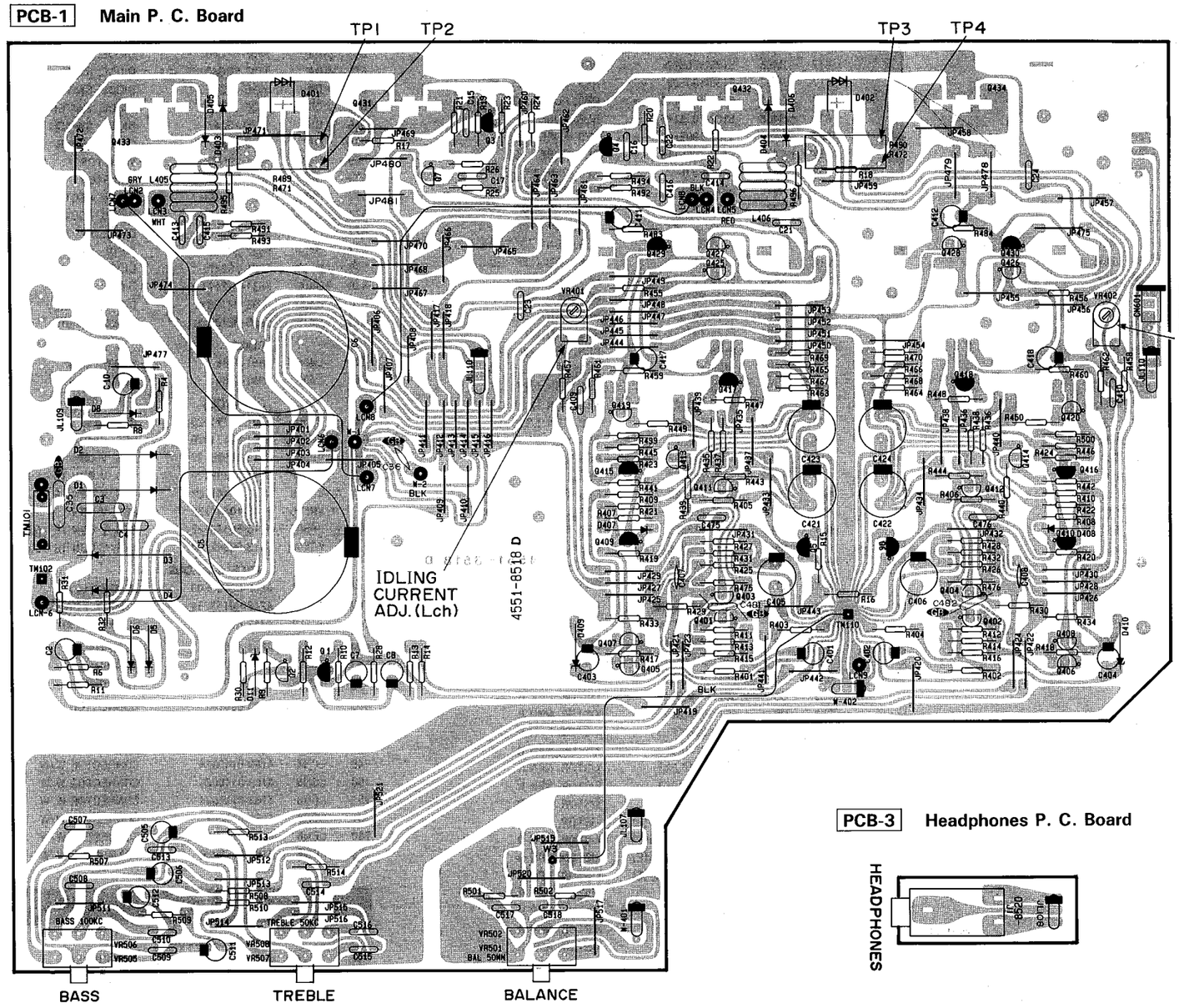


PCB-11 Equalizer P. C. Board

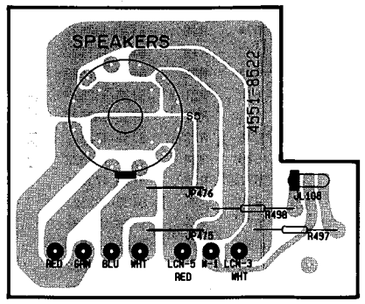


P. C. BOARDS

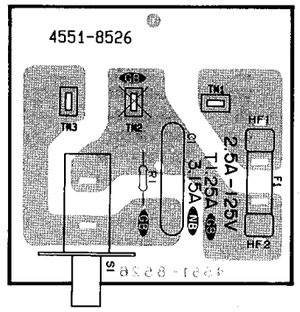
PCB-1 Main P. C. Board



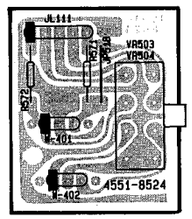
PCB-5 Speaker Switch P. C Board



PCB-9 Power Switch P. C. Board

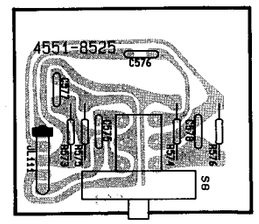


PCB-7 VR P. C. Board

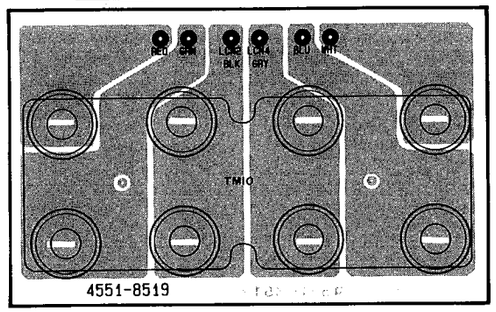


PCB-3 Headphones P. C. Board

PCB-8 Loudness P. C. Board



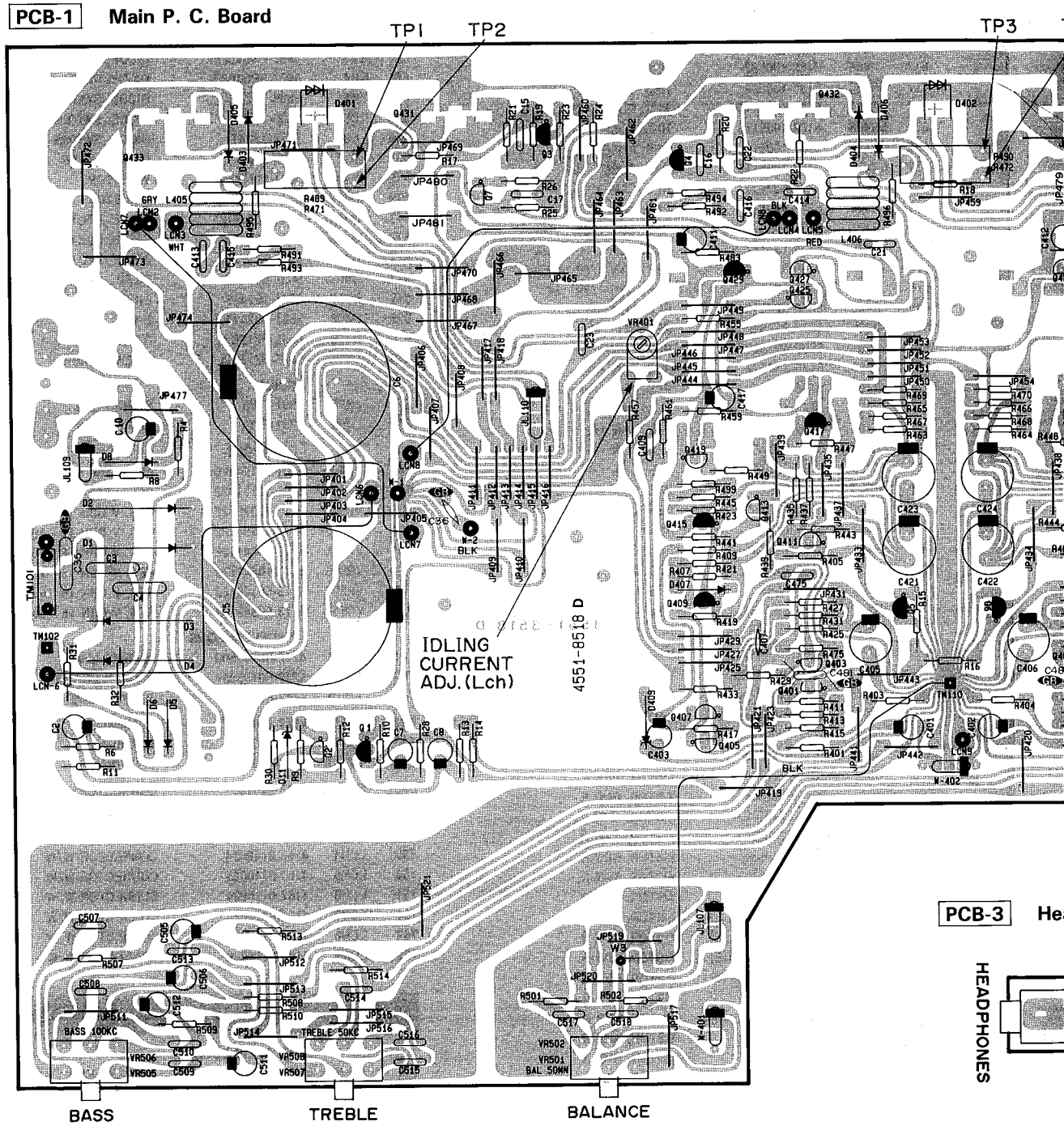
PCB-2 Speaker Terminal P. C. Board



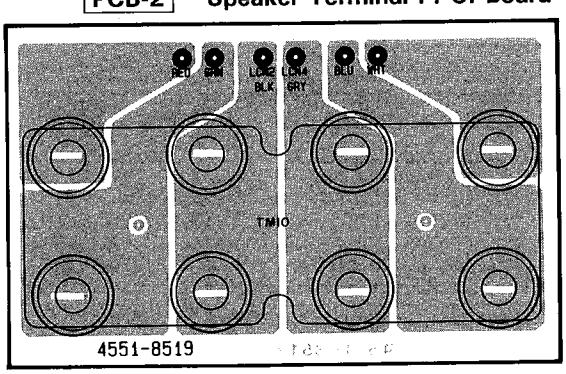
PCB-4 LED P. C. Board

P. C. BOARDS

PCB-1 Main P. C. Board



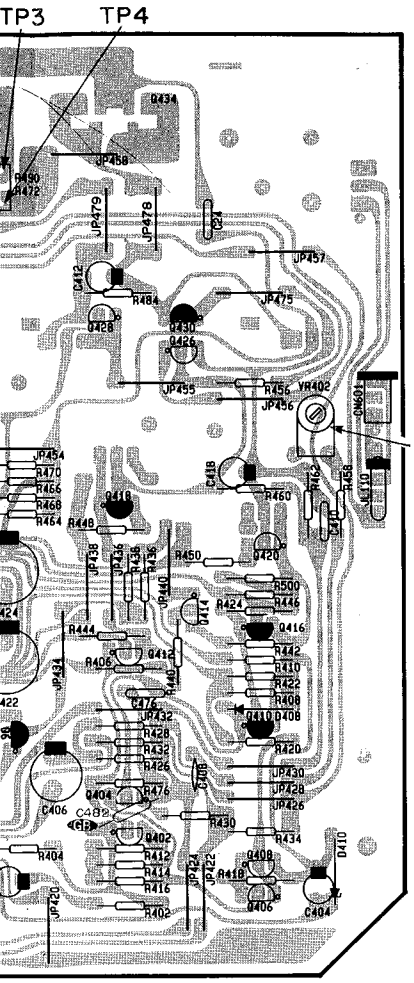
PCB-2 Speaker Terminal P. C. Board



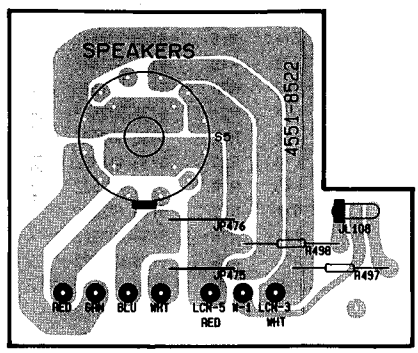
PCB-3 Hea

PCB-4 LE

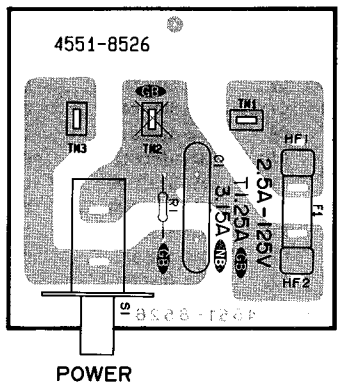
F G H I J



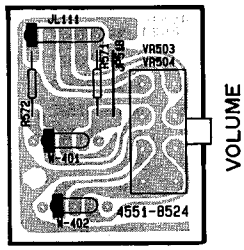
PCB-5 Speaker Switch P. C Board



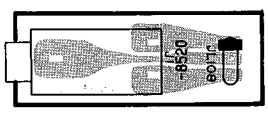
PCB-9 Power Switch P. C. Board



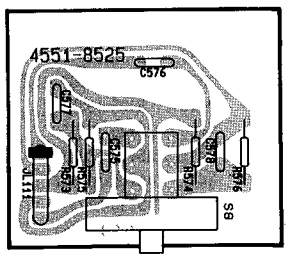
PCB-7 VR P. C. Board



-3 Headphones P. C. Board



PCB-8 Loudness P. C. Board



loudness

-4 LED P. C. Board

ELECTRICAL PARTS LIST

Ser. No.	Ref. No.	Part No.	Description
PCB-1 MAIN P.C.BOARD			
		CAPACITORS	
662	C2	5345-106F041	CAP, MINI ELE 10μ/50V
689	C3	5362-103048	CAP, CER .01μ
689	C4	5362-103048	CAP, CER .01μ
687	C5	5341-S07FM822	CAP, ELE 8200μ/50V
687	C6	5341-S07FM822	CAP, ELE 8200μ/50V
660	C7	5345-105F041	CAP, MINI ELE 1μ/50V
661	C8	5345-107B041	CAP, MINI ELE 100μ/10V
659	C10	5345-106C041	CAP, MINI ELE 10μ/16V
663	C15	5354-683JIHM	CAP, MYL .068μ
663	C16	5354-683JIHM	CAP, MYL .068μ
664	C17	5354-473JIHM	CAP, MYL .047μ
665	C21	5354-104593	CAP, MYL .1μ
665	C22	5354-104593	CAP, MYL .1μ
665	C23	5354-104593	CAP, MYL .1μ
665	C24	5354-104593	CAP, MYL .1μ
057B	C35	5352-1041957	CAP, MTL .1μ GB
060B	C36	5361-103ZF	CAP, CER .01μ GB
581	C401	5345-476B0951	CAP, MINI ELE 47μ/10V
581	C402	5345-476B0951	CAP, MINI ELE 47μ/10V
587	C403	5345-476C0951	CAP, MINI ELE 47μ/16V
587	C404	5345-476C0951	CAP, MINI ELE 47μ/16V
582	C405	5345-227A0951	CAP, MINI ELE 220μ/6.3V
582	C406	5345-227A0951	CAP, MINI ELE 220μ/6.3V
592	C407	5353-020934	CAP, MCA 2p
592	C408	5353-020934	CAP, MCA 2p
590	C409	5359-1015851	CAP, PPP 100p
590	C410	5359-1015851	CAP, PPP 100p
583	C411	5345-106C0951	CAP, MINI ELE 10μ/16V
583	C412	5345-106C0951	CAP, MINI ELE 10μ/16V
595	C413	5354-683JIHM	CAP, MYL .068μ
595	C414	5354-683JIHM	CAP, MYL .068μ
595	C415	5354-683JIHM	CAP, MYL .068μ
595	C416	5354-683JIHM	CAP, MYL .068μ
583	C417	5345-106C0951	CAP, MINI ELE 10μ/16V
583	C418	5345-106C0951	CAP, MINI ELE 10μ/16V
584	C421	5345-337F041	CAP, MINI ELE 330μ/50V
584	C422	5345-337F041	CAP, MINI ELE 330μ/50V
584	C423	5345-337F041	CAP, MINI ELE 330μ/50V
584	C424	5345-337F041	CAP, MINI ELE 330μ/50V
590	C475	5359-1015851	CAP, PPP 100p
067B	C475	5359-3315851	CAP, PPP 330p GB
590	C476	5359-1015851	CAP, PPP 100p
067B	C476	5359-3315851	CAP, PPP 330p GB
065B	C481	5359-1015851	CAP, PPP 100p GB
065B	C482	5359-1015851	CAP, PPP 100p GB
585	C505	5345-225F0951	CAP, MINI ELE 2.2μ/50V
585	C506	5345-225F0951	CAP, MINI ELE 2.2μ/50V
596	C507	5354-273JIHM	CAP, MYL .027μ
596	C508	5354-273JIHM	CAP, MYL .027μ
599	C509	5354-154593	CAP, MYL .15μ
599	C510	5354-154593	CAP, MYL .15μ
586	C511	5345-106C0951	CAP, MINI ELE 10μ/16V
586	C512	5345-106C0951	CAP, MINI ELE 10μ/16V
597	C513	5354-682JIHM	CAP, MYL 6800p
597	C514	5354-682JIHM	CAP, MYL 6800p
598	C515	5354-393JIHM	CAP, MYL .039μ
598	C516	5354-393JIHM	CAP, MYL .039μ
591	C517	5359-3915851	CAP, PPP 390p
591B	C517	5359-2215851	CAP, PPP 220p GB
591	C518	5359-3915851	CAP, PPP 390p
591B	C518	5359-2215851	CAP, PPP 220p GB
		RESISTORS	
680	⚠R4	5102-2205116	RES, FUSE 22
668	R6	5135-103522	RES, CBN 1/2P 10K
674	R8	5135-332522	RES, CBN 1/2P 3.3K
670	R9	5135-472522	RES, CBN 1/2P 4.7K
670	R10	5135-472522	RES, CBN 1/2P 4.7K
667	R11	5135-822522	RES, CBN 1/2P 8.2K
669	R12	5135-104522	RES, CBN 1/2P 100K
675	R13	5135-683522	RES, CBN 1/2P 68K
676	R14	5135-333522	RES, CBN 1/2P 33K
672	R15	5135-223522	RES, CBN 1/2P 22K
672	R16	5135-223522	RES, CBN 1/2P 22K
674	R17	5135-332522	RES, CBN 1/2P 3.3K
674	R18	5135-332522	RES, CBN 1/2P 3.3K
673	R19	5135-821522	RES, CBN 1/2P 820
673	R20	5135-821522	RES, CBN 1/2P 820
674	R21	5135-332522	RES, CBN 1/2P 3.3K
674	R22	5135-332522	RES, CBN 1/2P 3.3K
670	R23	5135-472522	RES, CBN 1/2P 4.7K
670	R24	5135-472522	RES, CBN 1/2P 4.7K
671	R25	5135-473522	RES, CBN 1/2P 47K
672	R26	5135-223522	RES, CBN 1/2P 22K
671	R28	5135-473522	RES, CBN 1/2P 47K
668	R30	5135-103522	RES, CBN 1/2P 10K
666	R31	5135-682522	RES, CBN 1/2P 6.8K
666	R32	5135-682522	RES, CBN 1/2P 6.8K
603	R401	5135-102522	RES, CBN 1/2P 1K
603	R402	5135-102522	RES, CBN 1/2P 1K
604	R403	5135-683522	RES, CBN 1/2P 68K
604	R404	5135-683522	RES, CBN 1/2P 68K
605	R405	5135-122522	RES, CBN 1/2P 1.2K
605	R406	5135-122522	RES, CBN 1/2P 1.2K
605	R407	5135-122522	RES, CBN 1/2P 1.2K
605	R408	5135-122522	RES, CBN 1/2P 1.2K
606	R409	5135-682522	RES, CBN 1/2P 6.8K
606	R410	5135-682522	RES, CBN 1/2P 6.8K
607	R411	5135-680522	RES, CBN 1/2P 68
607	R412	5135-680522	RES, CBN 1/2P 68
607	R413	5135-680522	RES, CBN 1/2P 68
607	R414	5135-680522	RES, CBN 1/2P 68
623	R415	5135-222522	RES, CBN 1/2P 2.2K
623	R416	5135-222522	RES, CBN 1/2P 2.2K
609	R417	5135-561522	RES, CBN 1/2P 560
609	R418	5135-561522	RES, CBN 1/2P 560
604	R419	5135-683522	RES, CBN 1/2P 68K
604	R420	5135-683522	RES, CBN 1/2P 68K
638	⚠R421	5102-3315116	RES, FUSE 330
638	⚠R422	5102-3315116	RES, FUSE 330
638	⚠R423	5102-3315116	RES, FUSE 330
638	⚠R424	5102-3315116	RES, FUSE 330
610	R425	5135-473522	RES, CBN 1/2P 47K
610	R426	5135-473522	RES, CBN 1/2P 47K
610	R427	5135-473522	RES, CBN 1/2P 47K
610	R428	5135-473522	RES, CBN 1/2P 47K
611	R429	5135-224522	RES, CBN 1/2P 220K
611	R430	5135-224522	RES, CBN 1/2P 220K
618	R431	5135-121522	RES, CBN 1/2P 120
618	R432	5135-121522	RES, CBN 1/2P 120
612	R433	5135-222522	RES, CBN 1/2P 2.2K
612	R434	5135-222522	RES, CBN 1/2P 2.2K
613	R435	5135-223522	RES, CBN 1/2P 22K
613	R436	5135-223522	RES, CBN 1/2P 22K
613	R437	5135-223522	RES, CBN 1/2P 22K
613	R438	5135-223522	RES, CBN 1/2P 22K
624	R439	5135-153522	RES, CBN 1/2P 15K
624	R440	5135-153522	RES, CBN 1/2P 15K
614	R441	5135-123522	RES, CBN 1/2P 12K
614	R442	5135-123522	RES, CBN 1/2P 12K
633	R443	5174-222381	RES, MTL 1/4 2.2K
633	R444	5174-222381	RES, MTL 1/4 2.2K
633	R445	5174-222381	RES, MTL 1/4 2.2K
633	R446	5174-222381	RES, MTL 1/4 2.2K
636	⚠R447	5102-4705116	RES, FUSE 47
636	⚠R448	5102-4705116	RES, FUSE 47
636	⚠R449	5102-4705116	RES, FUSE 47
636	⚠R450	5102-4705116	RES, FUSE 47
615	R455	5135-821522	RES, CBN 1/2P 820
615	R456	5135-821522	RES, CBN 1/2P 820
615	R457	5135-821522	RES, CBN 1/2P 820
615	R458	5135-821522	RES, CBN 1/2P 820
625	R459	5135-183522	RES, CBN 1/2P 18K
625	R460	5135-183522	RES, CBN 1/2P 18K
625	R461	5135-183522	RES, CBN 1/2P 18K
625	R462	5135-183522	RES, CBN 1/2P 18K
617	R463	5135-100522	RES, CBN 1/2P 10
617	R464	5135-100522	RES, CBN 1/2P 10
617	R465	5135-100522	RES, CBN 1/2P 10
617	R466	5135-100522	RES, CBN 1/2P 10
637	⚠R467	5102-1005116	RES, FUSE 10
637	⚠R468	5102-1005116	RES, FUSE 10
637	⚠R469	5102-1005116	RES, FUSE 10
637	⚠R470	5102-1005116	RES, FUSE 10
639	R471	5273-R27672	RES, CEM 3P .27
639	R472	5273-R27672	RES, CEM 3P .27
605	R475	5135-122522	RES, CBN 1/2P 1.2K
605	R476	5135-122522	RES, CBN 1/2P 1.2K
616	R483	5135-820522	RES, CBN 1/2P 82
616	R484	5135-820522	RES, CBN 1/2P 82
639	R489	5273-R27672	RES, CEM 3P .27
639	R490	5273-R27672	RES, CEM 3P .27
627	R491	5135-4R7522	RES, CBN 1/2P 4.7
627	R492	5135-4R7522	RES, CBN 1/2P 4.7
627	R493	5135-4R7522	RES, CBN 1/2P 4.7
627	R494	5135-4R7522	RES, CBN 1/2P 4.7
626	R495	5135-220522	RES, CBN 1/2P 22
626	R496	5135-220522	RES, CBN 1/2P 22
607	R499	5135-680522	RES, CBN 1/2P 68
607	R500	5135-680522	RES, CBN 1/2P 68
619	R501	5135-102522	RES, CBN 1/2P 1K
619	R502	5135-102522	RES, CBN 1/2P 1K
620	R507	5135-153522	RES, CBN 1/2P 15K
620	R508	5135-153522	RES, CBN 1/2P 15K
621	R509	5135-272522	RES, CBN 1/2P 2.7K
621	R510	5135-272522	RES, CBN 1/2P 2.7K
622	R513	5135-681522	RES, CBN 1/2P 680
622	R514	5135-681522	RES, CBN 1/2P 680
		TRANSISTORS	
652	Q1	5611-1115(F)or(E)	XISTOR, PNP R
651	Q2	5613-2603(F)or(E)	XISTOR, NPN R
655	Q3	5611-970(BL)	XISTOR, PNP R
653	Q4	5611-970(BL)	XISTOR, PNP R
653	Q5	5611-970(BL)	XISTOR, PNP R
653	Q6	5611-970(BL)	XISTOR, PNP R
654	Q7	5613-2240(BL)	XISTOR, NPN R
561	Q401	5613-2240(BL)	XISTOR, NPN R
561	Q402	5613-2240(BL)	XISTOR, NPN R
561	Q403	5613-2240(BL)	XISTOR, NPN R
561	Q404	5613-2240(BL)	XISTOR, NPN R
562	Q405	5613-2320L(F)or(E)	XISTOR, NPN R
562	Q406	5613-2320L(F)or(E)	XISTOR, NPN R
562	Q407	5613-2320L(F)or(E)	XISTOR, NPN R
562	Q408	5613-2320L(F)or(E)	XISTOR, NPN R
563	Q409	5611-970(BL)	XISTOR, PNP R
563	Q410	5611-970(BL)	XISTOR, PNP R
574	Q411	5613-2240(BL)	XISTOR, NPN R
574	Q412	5613-2240(BL)	XISTOR, NPN R
573	Q413	5613-2240(BL)	XISTOR, NPN R
573	Q414	5613-2240(BL)	XISTOR, NPN R
563	Q415	5611-970(BL)	XISTOR, PNP R
563	Q416	5611-970(BL)	XISTOR, PNP R
564	Q417	5612-646A(C)	XISTOR, PNP A
564	Q418	5612-646A(C)	XISTOR, PNP A
565	Q419	5614-666A(C)	XISTOR, NPN A
565	Q420	5614-666A(C)	XISTOR, NPN A
566	Q425	5613-945(K)or(P)	XISTOR, NPN R
566	Q426	5613-945(K)or(P)	XISTOR, NPN R
567	Q427	5614-667A(C)	XISTOR, NPN A
567	Q428	5614-667A(C)	XISTOR, NPN A
568	Q429	5612-647A(C)	XISTOR, PNP A
568	Q430	5612-647A(C)	XISTOR, PNP A
569	Q431	5613-3181(O)or(R)	XISTOR, NPN R
569	Q432	5613-3181(O)or(R)	XISTOR, NPN R
571	Q433	5611-1264(O)or(R)	XISTOR, PNP R
571	Q434	5611-1264(O)or(R)	XISTOR, PNP R
		DIODES	
681	⚠D1	5632-ERC402FL	DIODE, RECT
681	⚠D2	5632-ERC402FL	DIODE, RECT
681	⚠D3	5632-ERC402FL	DIODE, RECT
681	⚠D4	5632-ERC402FL	DIODE, RECT
656	D5	5636-1S2471	DIODE, SWITCH
656	D6	5636-1S2471	DIODE, SWITCH
656	D8	5636-1S2471	DIODE, SWITCH
657	D11	5635-HZ6B-1L	DIODE, ZENER
579	D401	5641-MV12YM	VARISTOR
579	D402	5641-MV12YM	VARISTOR
577	D403	5632-S5566B	DIODE, RECT
577	D404	5632-S5566B	DIODE, RECT
577	D405	5632-S5566B	DIODE, RECT
577	D406	5632-S5566B	DIODE, RECT
575	D407	5631-1S2473	DIODE, DET
575	D408	5631-1S2473	DIODE, DET
576	D409	5635-HZ12B2L	DIODE, ZENER
576	D410	5635-HZ12B2L	DIODE, ZENER
		COILS	
644	L405	5991-7165	SPRING COIL
644	L406	5991-7165	SPRING COIL
		CONTROLS	
641	VR401	5101-50171920	RES, SEMI FIX 500
641	VR402	5101-50171920	RES, SEMI FIX 500
720	VR501	5113-50399122	RES, V CBN 16 50K
720	VR502	5113-50399122	RES, V CBN 16 50K
714	VR505	5113-10441122	RES, V CBN 16 100K
714	VR506	5113-10441122	RES, V CBN 16 100K
717	VR507	5113-50342122	RES, V CBN 16 50K
717	VR508	5113-50342122	RES, V CBN 16 50K
		MISCELLANEOUS	
764	JL107	4242-R0203600	JUMPER LEAD
763	JL109	4242-R0103251	JUMPER LEAD
762	JL110	4242-R0104181	JUMPER LEAD
694	TM101	4214-11023	TERMINAL
693	TM102	4214-11013	TERMINAL
646	TM110	4214-11013	TERMINAL
699	CN601	4443-030185	CONNECTOR
747	LCN2	4163-0140026	CONNECTOR W/W
748	LCN3	4163-0140027	CONNECTOR W/W
749	LCN4	4163-0140024	CONNECTOR W/W
750	LCN5	4163-0140025	CONNECTOR W/W
751	LCN6	4163-0110024	CONNECTOR W/W
751	LCN7	4163-0110024	CONNECTOR W/W
760	LCN8	4163-0112024	CONNECTOR W/W
753	LCN9	4163-0116020	CONNECTOR W/W
PCB-2 SPEAKER TERMINAL P.C.BOARD			
		MISCELLANEOUS	
761	JL120	4242-043805	JUMPER LEAD
743	TM10	4214-156	TERMINAL

ELECTRICAL PARTS LIST

Ser. No.	Ref. No.	Part No.	Description
		PCB-1 MAIN P.C.BOARD	
		CAPACITORS	
662	C2	5345-106F041	CAP, MINI ELE 10μ/50V
689	C3	5362-103048	CAP, CER .01μ
689	C4	5362-103048	CAP, CER .01μ
687	C5	5341-S07FM822	CAP, ELE 8200μ/50V
687	C6	5341-S07FM822	CAP, ELE 8200μ/50V
660	C7	5345-105F041	CAP, MINI ELE 1μ/50V
661	C8	5345-107B041	CAP, MINI ELE 100μ/10V
659	C10	5345-106C041	CAP, MINI ELE 10μ/16V
663	C15	5354-683JIHM	CAP, MYL .068μ
663	C16	5354-683JIHM	CAP, MYL .068μ
664	C17	5354-473JIHM	CAP, MYL .047μ
665	C21	5354-104593	CAP, MYL .1μ
665	C22	5354-104593	CAP, MYL .1μ
665	C23	5354-104593	CAP, MYL .1μ
665	C24	5354-104593	CAP, MYL .1μ
057B	C35	5352-1041957	CAP, MTL .1μ GB
060B	C36	5361-103ZF	CAP, CER .01μ GB
581	C401	5345-476B0951	CAP, MINI ELE 47μ/10V
581	C402	5345-476B0951	CAP, MINI ELE 47μ/10V
587	C403	5345-476C0951	CAP, MINI ELE 47μ/16V
587	C404	5345-476C0951	CAP, MINI ELE 47μ/16V
582	C405	5345-227A0951	CAP, MINI ELE 220μ/6.3V
582	C406	5345-227A0951	CAP, MINI ELE 220μ/6.3V
592	C407	5353-020934	CAP, MCA 2p
592	C408	5353-020934	CAP, MCA 2p
590	C409	5359-101585I	CAP, PPP 100p
590	C410	5359-101585I	CAP, PPP 100p
583	C411	5345-106C095I	CAP, MINI ELE 10μ/16V
583	C412	5345-106C095I	CAP, MINI ELE 10μ/16V
595	C413	5354-683JIHM	CAP, MYL .068μ
595	C414	5354-683JIHM	CAP, MYL .068μ
595	C415	5354-683JIHM	CAP, MYL .068μ
595	C416	5354-683JIHM	CAP, MYL .068μ
583	C417	5345-106C095I	CAP, MINI ELE 10μ/16V
583	C418	5345-106C095I	CAP, MINI ELE 10μ/16V
584	C421	5345-337F041	CAP, MINI ELE 330μ/50V
584	C422	5345-337F041	CAP, MINI ELE 330μ/50V
584	C423	5345-337F041	CAP, MINI ELE 330μ/50V
584	C424	5345-337F041	CAP, MINI ELE 330μ/50V
590	C475	5359-101585I	CAP, PPP 100p
067B	C475	5359-331585I	CAP, PPP 330p GB
590	C476	5359-101585I	CAP, PPP 100p
067B	C476	5359-331585I	CAP, PPP 330p GB
065B	C481	5359-101585I	CAP, PPP 100p GB
065B	C482	5359-101585I	CAP, PPP 100p GB
585	C505	5345-225F095I	CAP, MINI ELE 2.2μ/50V
585	C506	5345-225F095I	CAP, MINI ELE 2.2μ/50V
596	C507	5354-273JIHM	CAP, MYL .027μ
596	C508	5354-273JIHM	CAP, MYL .027μ
599	C509	5354-154593	CAP, MYL .15μ
599	C510	5354-154593	CAP, MYL .15μ
586	C511	5345-106C095I	CAP, MINI ELE 10μ/16V
586	C512	5345-106C095I	CAP, MINI ELE 10μ/16V
597	C513	5354-682JIHM	CAP, MYL 6800p
597	C514	5354-682JIHM	CAP, MYL 6800p
598	C515	5354-393JIHM	CAP, MYL .039μ
598	C516	5354-393JIHM	CAP, MYL .039μ
591	C517	5359-391585I	CAP, PPP 390p
591B	C517	5359-221585I	CAP, PPP 220p GB
591	C518	5359-391585I	CAP, PPP 390p
591B	C518	5359-221585I	CAP, PPP 220p GB
		RESISTORS	
680	⚠R4	5102-2205116	RES, FUSE 22
668	R6	5135-103522	RES, CBN 1/2P 10K
674	R8	5135-332522	RES, CBN 1/2P 3.3K
670	R9	5135-472522	RES, CBN 1/2P 4.7K
670	R10	5135-472522	RES, CBN 1/2P 4.7K
667	R11	5135-822522	RES, CBN 1/2P 8.2K
669	R12	5135-104522	RES, CBN 1/2P 100K
675	R13	5135-683522	RES, CBN 1/2P 68K
676	R14	5135-333522	RES, CBN 1/2P 33K
672	R15	5135-223522	RES, CBN 1/2P 22K
672	R16	5135-223522	RES, CBN 1/2P 22K
674	R17	5135-332522	RES, CBN 1/2P 3.3K
674	R18	5135-332522	RES, CBN 1/2P 3.3K
673	R19	5135-821522	RES, CBN 1/2P 820
673	R20	5135-821522	RES, CBN 1/2P 820
674	R21	5135-332522	RES, CBN 1/2P 3.3K
674	R22	5135-332522	RES, CBN 1/2P 3.3K
670	R23	5135-472522	RES, CBN 1/2P 4.7K
670	R24	5135-472522	RES, CBN 1/2P 4.7K
671	R25	5135-473522	RES, CBN 1/2P 47K
672	R26	5135-223522	RES, CBN 1/2P 22K
671	R28	5135-473522	RES, CBN 1/2P 47K
668	R30	5135-103522	RES, CBN 1/2P 10K
666	R31	5135-682522	RES, CBN 1/2P 6.8K
666	R32	5135-682522	RES, CBN 1/2P 6.8K
603	R401	5135-102522	RES, CBN 1/2P 1K
603	R402	5135-102522	RES, CBN 1/2P 1K
604	R403	5135-683522	RES, CBN 1/2P 68K
604	R404	5135-683522	RES, CBN 1/2P 68K
605	R405	5135-122522	RES, CBN 1/2P 1.2K
605	R406	5135-122522	RES, CBN 1/2P 1.2K
605	R407	5135-122522	RES, CBN 1/2P 1.2K
605	R408	5135-122522	RES, CBN 1/2P 1.2K
606	R409	5135-682522	RES, CBN 1/2P 6.8K
606	R410	5135-682522	RES, CBN 1/2P 6.8K
607	R411	5135-680522	RES, CBN 1/2P 68
607	R412	5135-680522	RES, CBN 1/2P 68
607	R413	5135-680522	RES, CBN 1/2P 68
607	R414	5135-680522	RES, CBN 1/2P 68
623	R415	5135-222522	RES, CBN 1/2P 2.2K
623	R416	5135-222522	RES, CBN 1/2P 2.2K
609	R417	5135-561522	RES, CBN 1/2P 560
609	R418	5135-561522	RES, CBN 1/2P 560
604	R419	5135-683522	RES, CBN 1/2P 68K
604	R420	5135-683522	RES, CBN 1/2P 68K
638	⚠R421	5102-3315116	RES, FUSE 330
638	⚠R422	5102-3315116	RES, FUSE 330
638	⚠R423	5102-3315116	RES, FUSE 330
638	⚠R424	5102-3315116	RES, FUSE 330
610	R425	5135-473522	RES, CBN 1/2P 47K
610	R426	5135-473522	RES, CBN 1/2P 47K
610	R427	5135-473522	RES, CBN 1/2P 47K
610	R428	5135-473522	RES, CBN 1/2P 47K
611	R429	5135-224522	RES, CBN 1/2P 220K
611	R430	5135-224522	RES, CBN 1/2P 220K
618	R431	5135-121522	RES, CBN 1/2P 120
618	R432	5135-121522	RES, CBN 1/2P 120
612	R433	5135-222522	RES, CBN 1/2P 2.2K
612	R434	5135-222522	RES, CBN 1/2P 2.2K
613	R435	5135-223522	RES, CBN 1/2P 22K
613	R436	5135-223522	RES, CBN 1/2P 22K
613	R437	5135-223522	RES, CBN 1/2P 22K
613	R438	5135-223522	RES, CBN 1/2P 22K
624	R439	5135-153522	RES, CBN 1/2P 15K
624	R440	5135-153522	RES, CBN 1/2P 15K
614	R441	5135-123522	RES, CBN 1/2P 12K
614	R442	5135-123522	RES, CBN 1/2P 12K
633	R443	5174-222381	RES, MTL 1/4 2.2K
633	R444	5174-222381	RES, MTL 1/4 2.2K
633	R445	5174-222381	RES, MTL 1/4 2.2K
633	R446	5174-222381	RES, MTL 1/4 2.2K
636	⚠R447	5102-4705116	RES, FUSE 47
636	⚠R448	5102-4705116	RES, FUSE 47
636	⚠R449	5102-4705116	RES, FUSE 47
636	⚠R450	5102-4705116	RES, FUSE 47
615	R455	5135-821522	RES, CBN 1/2P 820
615	R456	5135-821522	RES, CBN 1/2P 820
615	R457	5135-821522	RES, CBN 1/2P 820
615	R458	5135-821522	RES, CBN 1/2P 820

Ser. No.	Ref. No.	Part No.	Description
625	R459	5135-183522	RES, CBN 1/2P 18K
625	R460	5135-183522	RES, CBN 1/2P 18K
625	R461	5135-183522	RES, CBN 1/2P 18K
625	R462	5135-183522	RES, CBN 1/2P 18K
617	R463	5135-100522	RES, CBN 1/2P 10
617	R464	5135-100522	RES, CBN 1/2P 10
617	R465	5135-100522	RES, CBN 1/2P 10
617	R466	5135-100522	RES, CBN 1/2P 10
637	⚠R467	5102-1005116	RES, FUSE 10
637	⚠R468	5102-1005116	RES, FUSE 10
637	⚠R469	5102-1005116	RES, FUSE 10
637	⚠R470	5102-1005116	RES, FUSE 10
639	R471	5273-R27672	RES, CEM 3P .27
639	R472	5273-R27672	RES, CEM 3P .27
605	R475	5135-122522	RES, CBN 1/2P 1.2K
605	R476	5135-122522	RES, CBN 1/2P 1.2K
616	R483	5135-820522	RES, CBN 1/2P 82
616	R484	5135-820522	RES, CBN 1/2P 82
639	R489	5273-R27672	RES, CEM 3P .27
639	R490	5273-R27672	RES, CEM 3P .27
627	R491	5135-4R7522	RES, CBN 1/2P 4.7
627	R492	5135-4R7522	RES, CBN 1/2P 4.7
627	R493	5135-4R7522	RES, CBN 1/2P 4.7
627	R494	5135-4R7522	RES, CBN 1/2P 4.7
626	R495	5135-220522	RES, CBN 1/2P 22
626	R496	5135-220522	RES, CBN 1/2P 22
607	R499	5135-680522	RES, CBN 1/2P 68
607	R500	5135-680522	RES, CBN 1/2P 68
619	R501	5135-102522	RES, CBN 1/2P 1K
619	R502	5135-102522	RES, CBN 1/2P 1K
620	R507	5135-153522	RES, CBN 1/2P 15K
620	R508	5135-153522	RES, CBN 1/2P 15K
621	R509	5135-272522	RES, CBN 1/2P 2.7K
621	R510	5135-272522	RES, CBN 1/2P 2.7K
622	R513	5135-681522	RES, CBN 1/2P 680
622	R514	5135-681522	RES, CBN 1/2P 680
		TRANSISTORS	
652	Q1	5611-1115(F)or(E)	XISTOR, PNP R
651	Q2	5613-2603(F)or(E)	XISTOR, NPN R
655	Q3	5611-970(BL)	XISTOR, PNP R
653	Q4	5611-970(BL)	XISTOR, PNP R
653	Q5	5611-970(BL)	XISTOR, PNP R
653	Q6	5611-970(BL)	XISTOR, PNP R
654	Q7	5613-2240(BL)	XISTOR, NPN R
561	Q401	5613-2240(BL)	XISTOR, NPN R
561	Q402	5613-2240(BL)	XISTOR, NPN R
561	Q403	5613-2240(BL)	XISTOR, NPN R
561	Q404	5613-2240(BL)	XISTOR, NPN R
562	Q405	5613-2320L(F)or(E)	XISTOR, NPN R
562	Q406	5613-2320L(F)or(E)	XISTOR, NPN R
562	Q407	5613-2320L(F)or(E)	XISTOR, NPN R
562	Q408	5613-2320L(F)or(E)	XISTOR, NPN R
563	Q409	5611-970(BL)	XISTOR, PNP R
563	Q410	5611-970(BL)	XISTOR, PNP R
574	Q411	5613-2240(BL)	XISTOR, NPN R
574	Q412	5613-2240(BL)	XISTOR, NPN R
573	Q413	5613-2240(BL)	XISTOR, NPN R
573	Q414	5613-2240(BL)	XISTOR, NPN R
563	Q415	5611-970(BL)	XISTOR, PNP R
563	Q416	5611-970(BL)	XISTOR, PNP R
564	Q417	5612-646A(C)	XISTOR, PNP A
564	Q418	5612-646A(C)	XISTOR, PNP A
565	Q419	5614-666A(C)	XISTOR, NPN A
565	Q420	5614-666A(C)	XISTOR, NPN A
566	Q425	5613-945(K)or(P)	XISTOR, NPN R
566	Q426	5613-945(K)or(P)	XISTOR, NPN R
567	Q427	5614-667A(C)	XISTOR, NPN A
567	Q428	5614-667A(C)	XISTOR, NPN A
568	Q429	5612-647A(C)	XISTOR, PNP A
568	Q430	5612-647A(C)	XISTOR, PNP A
569	Q431	5613-3181(O)or(R)	XISTOR, NPN R
569	Q432	5613-3181(O)or(R)	XISTOR, NPN R
571	Q433	5611-1264(O)or(R)	XISTOR, PNP R
571	Q434	5611-1264(O)or(R)	XISTOR, PNP R
		DIODES	
681	⚠D1	5632-ERC402FL	DIODE, RECT
681	⚠D2	5632-ERC402FL	DIODE, RECT
681	⚠D3	5632-ERC402FL	DIODE, RECT
681	⚠D4	5632-ERC402FL	DIODE, RECT
656	D5	5636-1S2471	DIODE, SWITCH
656	D6	5636-1S2471	DIODE, SWITCH
656	D8	5636-1S2471	DIODE, SWITCH
657	D11	5635-HZ6B-1L	DIODE, ZENER
579	D401	5641-MV12YM	VARISTOR
579	D402	5641-MV12YM	VARISTOR
577	D403	5632-S5566B	DIODE, RECT
577	D404	5632-S5566B	DIODE, RECT
577	D405	5632-S5566B	DIODE, RECT
577	D406	5632-S5566B	DIODE, RECT
575	D407	5631-1S2473	DIODE, DET
575	D408	5631-1S2473	DIODE, DET
576	D409	5635-HZ12B2L	DIODE, ZENER
576	D410	5635-HZ12B2L	DIODE, ZENER
		COILS	
644	L405	5991-7165	SPRING COIL
644	L406	5991-7165	SPRING COIL
		CONTROLS	
641	VR401	5101-50171920	RES, SEMI FIX 500
641	VR402	5101-50171920	RES, SEMI FIX 500
720	VR501	5113-50399122	RES, V CBN 16 50K
720	VR502	5113-50399122	RES, V CBN 16 50K
714	VR505	5113-10441122	RES, V CBN 16 100K
714	VR506	5113-10441122	RES, V CBN 16 100K
717	VR507	5113-50342122	RES, V CBN 16 50K
717	VR508	5113-50342122	RES, V CBN 16 50K
		MISCELLANEOUS	
764	JL107	4242-R0203600	JUMPER LEAD
763	JL109	4242-R0103251	JUMPER LEAD
762	JL110	4242-R0104181	JUMPER LEAD
694	TM101	4214-11023	TERMINAL
693	TM102	4214-11013	TERMINAL
646	TM110	4214-11013	TERMINAL
699	CN601	4443-030185	CONNECTOR
747	LCN2	4163-0140026	CONNECTOR W/W
748	LCN3	4163-0140027	CONNECTOR W/W
749	LCN4	4163-0140024	CONNECTOR W/W
750	LCN5	4163-0140025	CONNECTOR W/W
751	LCN6	4163-0110024	CONNECTOR W/W
751	LCN7	4163-0110024	CONNECTOR W/W
760	LCN8	4163-0112024	CONNECTOR W/W
753	LCN9	4163-0116020	CONNECTOR W/W

PCB-2 SPEAKER TERMINAL P.C.BOARD

		MISCELLANEOUS	
761	JL120	4242-043805	JUMPER LEAD
743	TM10	4214-156	TERMINAL

Ser. No.	Ref. No.	Part No.	Description
PCB-3 HEADPHONE P.C.BOARD			
		RESISTORS	
634	R497	5171-471571	RES, MTL 1 470
634	R498	5171-471571	RES, MTL 1 470
		MISCELLANEOUS	
736	J1	4451-00159	JACK, IP
PCB-4 LED P.C.BOARD			
		DIODES	
741	D9	5637-LT5D41B	LED
PCB-5 SPEAKER SWITCH P.C.BOARD			
729	S5	4411-00301104	SWITCH, ROTARY
765	JL108	4242-R0103101	JUMPER LEAD
PCB-7 VR P.C.BOARD			
		RESISTORS	
631	R571	5135-273522	RES, CBN 1/2P 27K
631	R572	5135-273522	RES, CBN 1/2P 27K
		CONTROLS	
711	VR503	5113-10419122	RES, V CBN 16 100K
711	VR504	5113-10419122	RES, V CBN 16 100K
PCB-8 LOUDNESS P.C.BOARD			
		CAPACITORS	
589	C575	5359-181585I	CAP, PPP 180p
589	C576	5359-181585I	CAP, PPP 180p
594	C577	5354-823J1HM	CAP, MYL .082μ
594	C578	5354-823J1HM	CAP, MYL .082μ
		RESISTORS	
629	R573	5135-472522	RES, CBN 1/2P 4.7K
629	R574	5135-472522	RES, CBN 1/2P 4.7K
630	R575	5135-273522	RES, CBN 1/2P 27K
630	R576	5232-273522	RES, CBN 1/2P 27K
		MISCELLANEOUS	
733	S8	4431-A027610	SWITCH, PUSH
766	JL111	4242-R0105800	JUMPER LEAD
PCB-9 POWER SWITCH P.C.BOARD			
		CAPACITORS	
688	⚠C1	5352-S010M103	CAP, MTL .01μ
		RESISTORS	
054B	⚠R1	5135-335522	RES, CBN 1/2P 3.3M GB
		MISCELLANEOUS	
732	⚠S1	4431-A01716	SWITCH, PUSH
684	⚠HF1	4472-0131	HOLDER, FUSE
684	⚠HF2	4472-0131	HOLDER, FUSE
696	TM1	4214-122	TERMINAL BK NB
696	TM2	4214-122	TERMINAL BK NB
696	TM3	4214-122	TERMINAL BK NB

Ser. No.	Ref. No.	Part No.	Description
PCB-10 FUNCTION P.C.BOARD			
		CAPACITORS	
059B	C581	5359-101585I	CAP, PPP 100p GB
059B	C582	5359-101585I	CAP, PPP 100p GB
		COILS	
058B	L591	5597-45502	CORE, BEADS GB
058B	L592	5597-45502	CORE, BEADS GB
723	S3	4411-00203104	SWITCH, ROTARY
726	S4	4411-00204204	SWITCH, ROTARY
700	CN107	4443-030185	CONNECTOR
754	LCN10	4163-0124020	CONNECTOR W/W
768	JL101	4242-R0103181	JUMPER LEAD
769	JL103	4242-R0104301	JUMPER LEAD
772	JL104	4242-R0107301	JUMPER LEAD
771	JL105	4242-R0107251	JUMPER LEAD
770	JL106	4242-R0105181	JUMPER LEAD
PCB-11 EQUALIZER P.C.BOARD			
		CAPACITORS	
066B	C551	5361-1032F	CAP, CER .01μ GB
066B	C552	5361-1032F	CAP, CER .01μ GB
069B	C553	5361-101KSL	CAP, CER 100p GB
069B	C554	5361-101KSL	CAP, CER 100p GB
070B	C555	5361-101KSL	CAP, CER 100p GB
070B	C556	5361-101KSL	CAP, CER 100p GB
513	C601	5345-336C0951	CAP, MINI ELE 33μ/16V
513	C602	5345-336C0951	CAP, MINI ELE 33μ/16V
520	C603	5359-121585I	CAP, PPP 120p
520	C604	5359-121585I	CAP, PPP 120p
514	C605	5345-107B0951	CAP, MINI ELE 100μ/10V
514	C606	5345-107B0951	CAP, MINI ELE 100μ/10V
521	C607	5359-562585I	CAP, PPP 5600p
521	C608	5359-562585I	CAP, PPP 5600p
522	C609	5359-202585I	CAP, PPP 2000p
522	C610	5359-202585I	CAP, PPP 2000p
515	C611	5345-106C0951	CAP, MINI ELE 10μ/16V
515	C612	5345-106C0951	CAP, MINI ELE 10μ/16V
517	C613	5345-337F041	CAP, MINI ELE 330μ/50V
516	C614	5345-227D041	CAP, MINI ELE 220μ/25V
516	C615	5345-227D041	CAP, MINI ELE 220μ/25V
523	C617	5353-040934	CAP, MCA 4p
523	C618	5353-040934	CAP, MCA 4p
522	C619	5359-202585I	CAP, PPP 2000p
522	C620	5359-202585I	CAP, PPP 2000p
056B	C631	5353-820534	CAP, MCA 82p GB
056B	C632	5353-820534	CAP, MCA 82p GB
068B	C633	5361-680KSL	CAP, CER 68p GB
068B	C634	5361-680KSL	CAP, CER 68p GB
		RESISTORS	
064B	R561	5135-102522	RES, CBN 1/2P 1K GB
064B	R562	5135-102522	RES, CBN 1/2P 1K GB
064B	R563	5135-102522	RES, CBN 1/2P 1K GB
064B	R564	5135-102522	RES, CBN 1/2P 1K GB
526	R601	5232-823J16P	RES, CBN 1/6P 82K
526	R602	5232-823J16P	RES, CBN 1/6P 82K
527	R603	5232-124J16P	RES, CBN 1/6P 120K
527	R604	5232-124J16P	RES, CBN 1/6P 120K
528	R605	5232-221J16P	RES, CBN 1/6P 220
528	R606	5232-221J16P	RES, CBN 1/6P 220
529	R607	5154-122J25R	RES, CBN 1/4R 1.2K
529	R608	5154-122J25R	RES, CBN 1/4R 1.2K
530	R609	5178-220381	RES, MTL 1/6 22
530	R610	5178-220381	RES, MTL 1/6 22
531	R611	5154-122J25R	RES, CBN 1/4R 1.2K
531	R612	5154-122J25R	RES, CBN 1/4R 1.2K
532	R613	5232-223J16P	RES, CBN 1/6P 22K
532	R614	5232-223J16P	RES, CBN 1/6P 22K

Ser. No.	Ref. No.	Part No.	Description
528	R615	5232-820J16P	RES, CBN 1/6P 82
528	R616	5232-820J16P	RES, CBN 1/6P 82
533	R617	5232-121J16P	RES, CBN 1/6P 120
533	R618	5232-121J16P	RES, CBN 1/6P 120
534	R621	5232-821J16P	RES, CBN 1/6P 820
534	R622	5232-821J16P	RES, CBN 1/6P 820
535	R623	5232-393J16P	RES, CBN 1/6P 39K
535	R624	5232-393J16P	RES, CBN 1/6P 39K
536	R625	5232-564J16P	RES, CBN 1/6P 560K
536	R626	5232-564J16P	RES, CBN 1/6P 560K
537	R627	5232-334J16P	RES, CBN 1/6P 330K
537	R628	5232-334J16P	RES, CBN 1/6P 330K
538	R629	5232-102J16P	RES, CBN 1/6P 1K
538	R630	5232-102J16P	RES, CBN 1/6P 1K
539	R631	5232-104J16P	RES, CBN 1/6P 100K
539	R632	5232-104J16P	RES, CBN 1/6P 100K
538	R633	5232-102J16P	RES, CBN 1/6P 1K
538	R634	5232-102J16P	RES, CBN 1/6P 1K
540	R635	5232-222J16P	RES, CBN 1/6P 2.2K
540	R636	5232-222J16P	RES, CBN 1/6P 2.2K
546	R637	5176-S010J471	RES, MTL 1/2 470
550	⚠R638	5102-2215116	RES, FUSE 220
551	⚠R639	5102-1815116	RES, FUSE 180
545	R640	5176-S010J331	RES, MTL 1/2 330
544	R641	5135-123522	RES, CBN 1/2P 12K
055B	R651	5232-102J16P	RES, CBN 1/6P 1K GB
055B	R652	5232-102J16P	RES, CBN 1/6P 1K GB
055B	R653	5232-102J16P	RES, CBN 1/6P 1K GB
056B	R654	5232-102J16P	RES, CBN 1/6P 1K GB
056B	R655	5232-102J16P	RES, CBN 1/6P 1K GB
056B	R656	5232-102J16P	RES, CBN 1/6P 1K GB
056B	R657	5232-102J16P	RES, CBN 1/6P 1K GB
056B	R658	5232-102J16P	RES, CBN 1/6P 1K GB
056B	R659	5232-102J16P	RES, CBN 1/6P 1K GB
056B	R660	5232-102J16P	RES, CBN 1/6P 1K GB
055B	R671	5232-102J16P	RES, CBN 1/6P 1K GB
055B	R672	5232-102J16P	RES, CBN 1/6P 1K GB
055B	R673	5232-102J16P	RES, CBN 1/6P 1K GB
055B	R674	5232-102J16P	RES, CBN 1/6P 1K GB
540	R681	5232-222J16P	RES, CBN 1/6P 2.2K
540	R682	5232-222J16P	RES, CBN 1/6P 2.2K
		TRANSISTORS	
501	Q601	5613-2320L(F)	XISTOR, NPN R
501	Q602	5613-2320L(F)	XISTOR, NPN R
503	Q603	5611-999L(F)	XISTOR, PNP R
503	Q604	5611-999L(F)	XISTOR, PNP R
504	Q605	5611-999L(F)	XISTOR, PNP R
504	Q606	5611-999L(F)	XISTOR, PNP R
501	Q607	5613-2320L(F)	XISTOR, NPN R
501	Q608	5613-2320L(F)	XISTOR, NPN R
501	Q609	5613-2320L(F)	XISTOR, NPN R
501	Q610	5613-2320L(F)	XISTOR, NPN R
501	Q611	5613-2320L(F)	XISTOR, NPN R
501	Q612	5613-2320L(F)	XISTOR, NPN R
505	Q613	5612-941(S)or(O)	XISTOR, PNP A
		DIODES	
509	D601	5635-HZ15-2L	DIODE, ZENER
510	D602	5632-S5566B	DIODE, RECT
		MISCELLANEOUS	
737	J2	4482-0133	PIN JACK, 2P BK GB
737C	J2	4482-7136	PIN JACK, 2P NB
738	J3	4484-46	PIN JACK, 4P BK GB
738C	J3	4484-50	PIN JACK, 4P NB
738	J4	4484-46	PIN JACK, 4P BK GB
738D	J4	4484-50	PIN JACK, 4P NB
739	J5	4486-15	PIN JACK, 6P BK GB
739C	J5	4486-18	PIN JACK, 6P NB
759	LCN11	4163-0108024	CONNECTOR W/W
752	LCN601	4163-0147020	CONNECTOR W/W
767	JL102	4242-R0203101	JUMPER READ

Ser. No.	Ref. No.	Part No.	Description
		CHASSIS MISCELLANEOUS	
051B		4411-102729	SWITCH, ROTARY GB
052B		4443-712	CONNECTOR GB
053B		4150-8	TUBING, SPE GB
683	⚠TI	5584-701526	XFORMER, POWER BK
683B	⚠TI	5584-S2503	XFORMER, POWER GB
683C	⚠TI	5584-S2504	XFORMER, POWER NB
685	⚠FI	5732-252031	FUSE BK
685B	⚠FI	5732-122052	FUSE GB
685C	⚠FI	5732-312036	FUSE NB
744	⚠SOI	4474-227	SOCKET, AC OUTLET BK NB
745	⚠PI	4161-71151	CORD W/PLUG BK
745B	⚠PI	4161-7256	CORD W/PLUG GB
745C	⚠PI	4161-00401192	CORD W/PLUG NB
745D	⚠PI	4161-04100	CORD W/PLUG (Australia model)
062B	LUG1	4211-4	LUG GB
650	LUG2	4211-4	LUG
062B	LUG3	4211-4	LUG GB
		PACKAGE PARTS LIST	
021B		1756-06303	LABEL GB
021C		1756-03113	LABEL NB
022B		1756-03108	LABEL GB
023C		1241-PB	POLYETHYLENE BAG NB
026B		1119-026	ATTACH SHEET GB
107		1111-J30301	OWNER GUIDE
107B		1111-J30302	OWNER GUIDE GB
107C		1111-J2048	OWNER GUIDE NB
108		1113-717004	OWNER CARD BK
108C		1113-OC	OWNER CARD NB
109		1119-047	ATTACH SHEET BK
109C		1119-GC	ATTACH SHEET NB
110		1119-0137	ATTACH SHEET BK
111		1119-01201	ATTACH SHEET BK
121		1241-C12732	POLYETHYLENE BAG
122		1241-C1491	POLYETHYLENE BAG
124		1221-927144	CARTON BOX
125		1222-7216	CUSHION
127		1223-11729	SOFT SHEET

ABBREVIATIONS IN PARTS LIST

CAPACITORS

CAP, MINI ELE : Electrolytic
CAP, CER : Ceramic
CAP, PPP : Polypropylene
CAP, MYL : Mylar
CAP, MCA : Mica
CAP, MINI BP : Bipolar
CAP, ELE BP : Electrolytic Bipolar
CAP, STY : Polystyrene Film
CAP, SPE : Special
CAP, TAN : Tantalum
470μ : 470μF
6800p : 6800pF
.047μ : 0.047μF

RESISTORS

RES, CBN 1/6P : Carbon 1/6W
RES, FUSE : Fuse
RES, CEM 5P : Cement 5W
RES, MTL 1P : Metal 1W
2.2K : 2.2kΩ
220 : 220Ω

TRANSISTORS

XISTOR : Transistor
FET : Field Effect Transistor

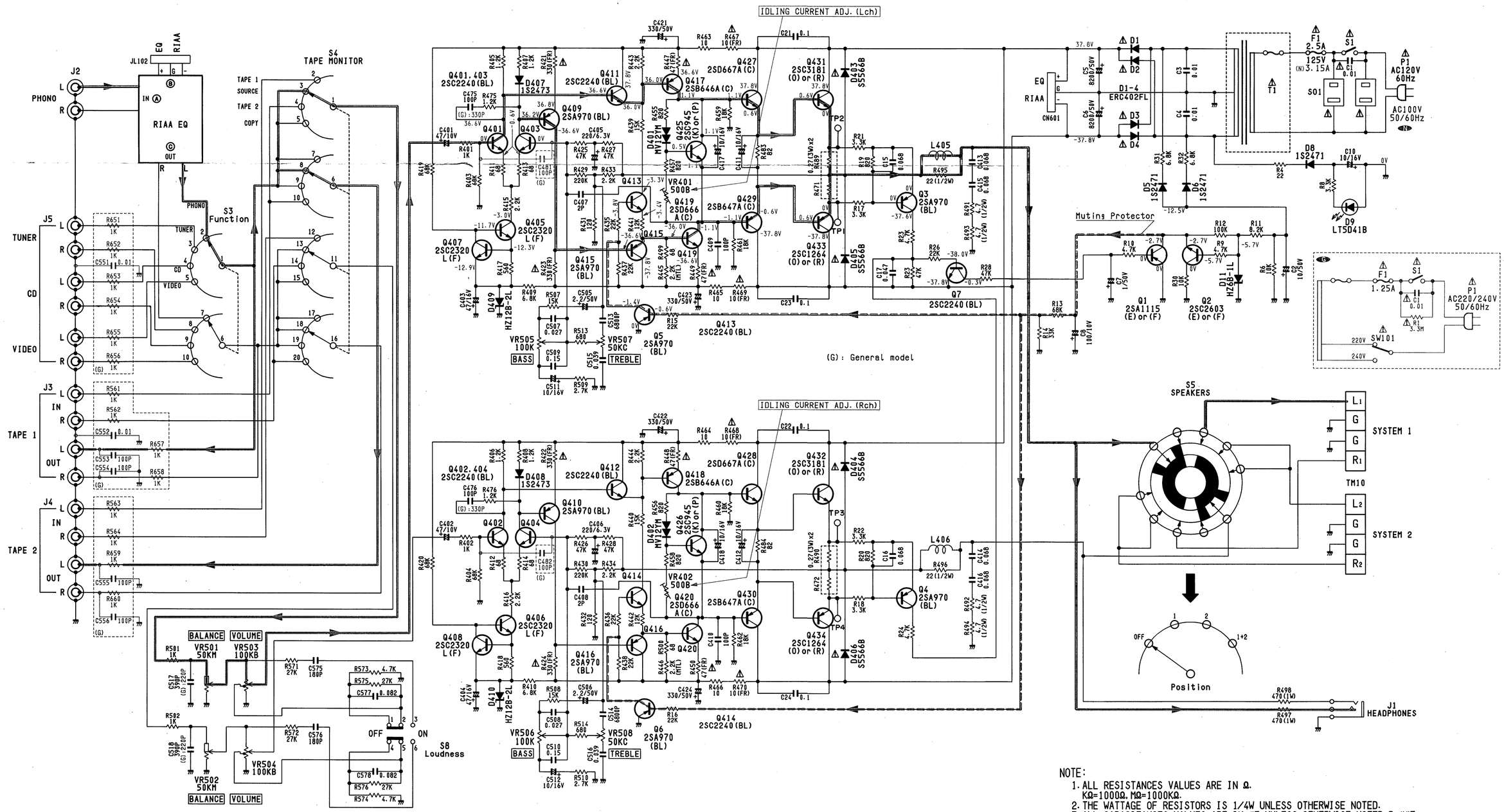
CONTROLS

RES, V CBN : Variable Carbon Resistor
RES, SEMI FIX : Semi-fixed Resistor

NOTE

⚠ SAFETY RELATED COMPONENT. USE ONLY EXACT REPLACEMENT PART AS SPECIFIED.

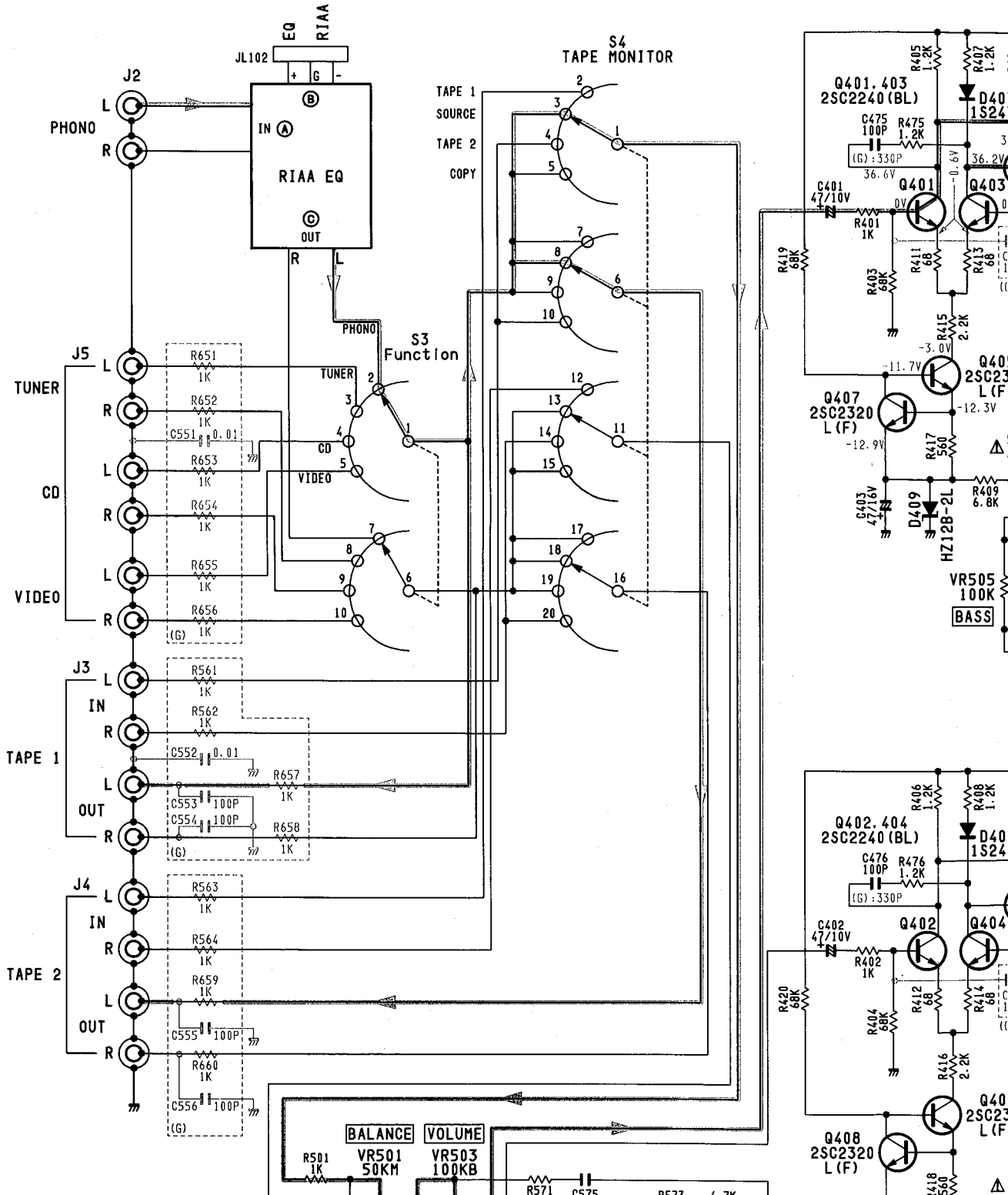
SCHEMATIC DIAGRAM

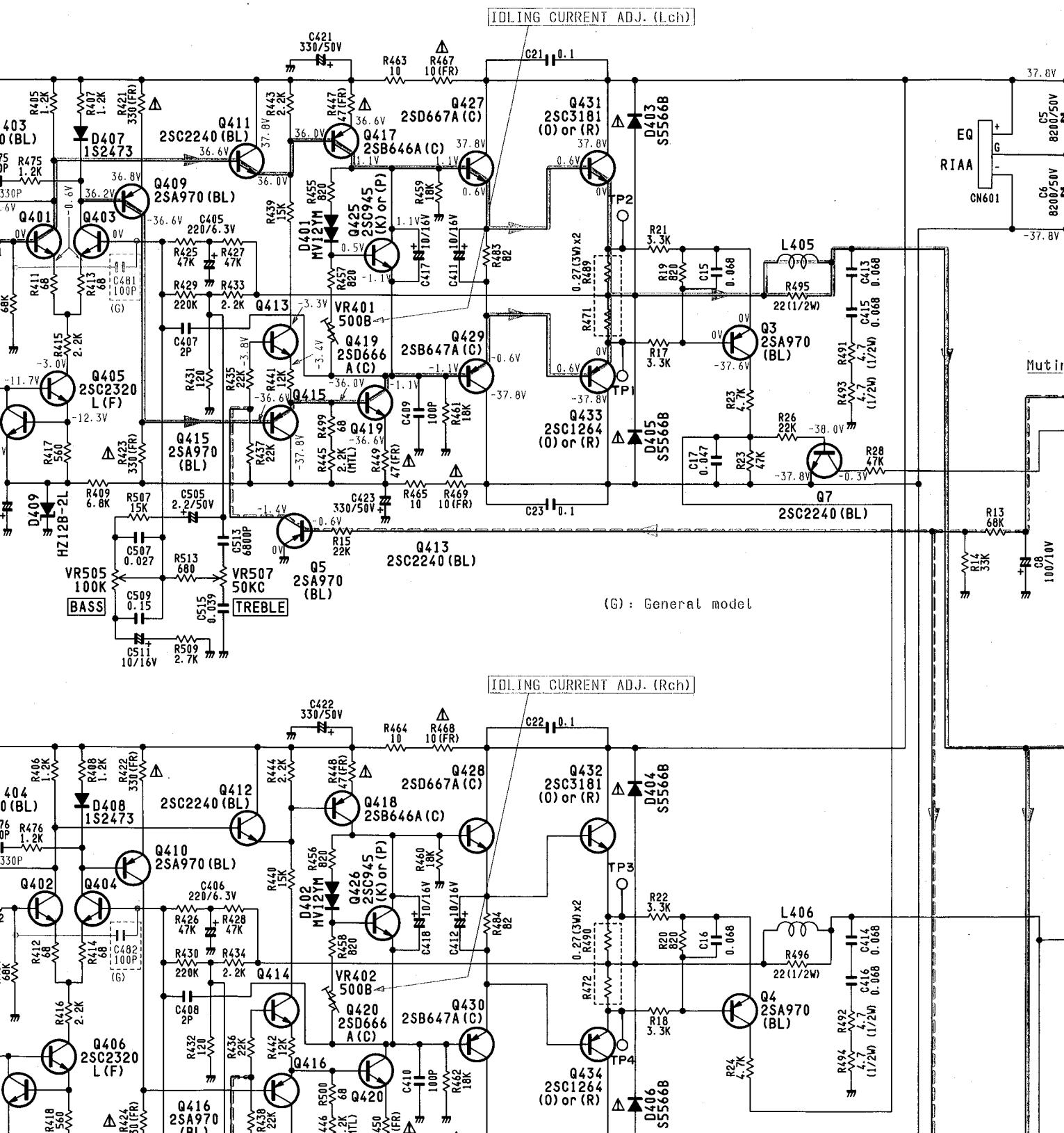


NOTE:

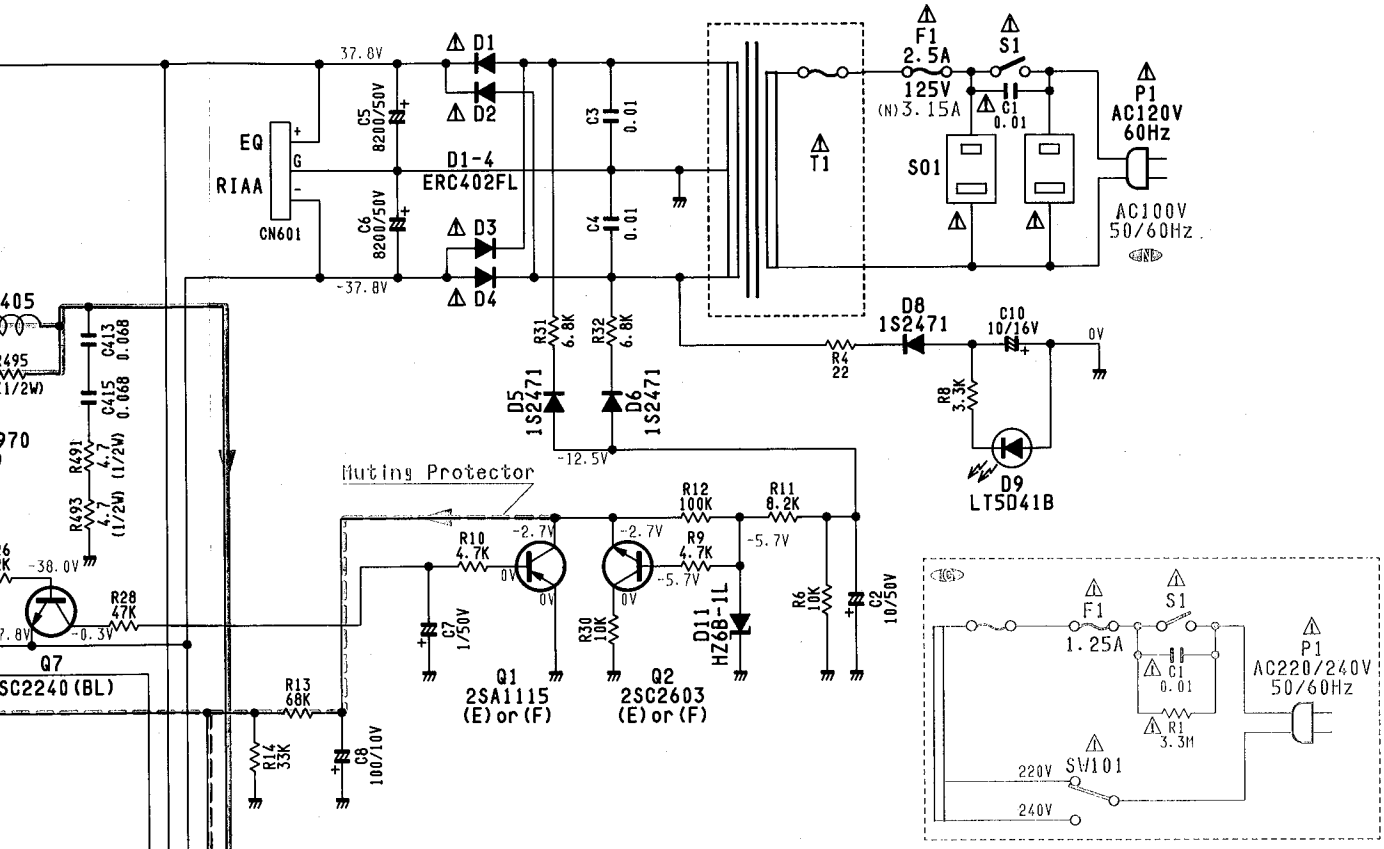
1. ALL RESISTANCES VALUES ARE IN Ω.
   KΩ=1000Ω, MΩ=1000KΩ.
2. THE WATTAGE OF RESISTORS IS 1/4W UNLESS OTHERWISE NOTED.
3. ALL CAPACITANCES VALUES ARE IN μF UNLESS OTHERWISE NOTED. P=μμF.
4. ...V:DC VOLTAGE AT NO SIGNAL UNLESS OTHERWISE NOTED.
5. ⚠ SAFETY REQUIREMENTS COMPONENTS IN ACCORDANCE WITH PRESENT SAFETY REGULATIONS. THESE COMPONENTS MUST ONLY BE REPLACED BY ORIGINAL PARTS.

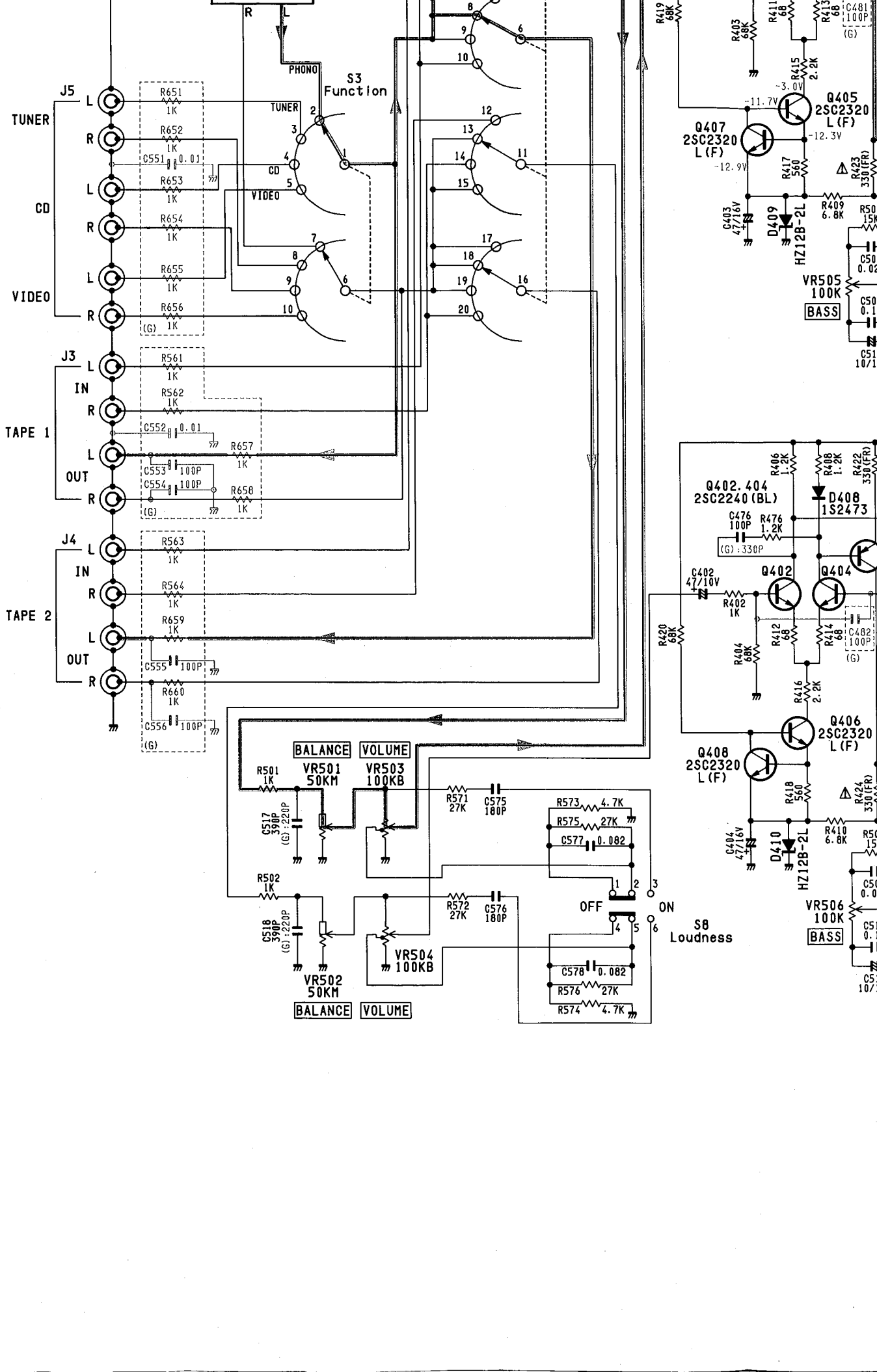
SCHEMATIC DIAGRAM

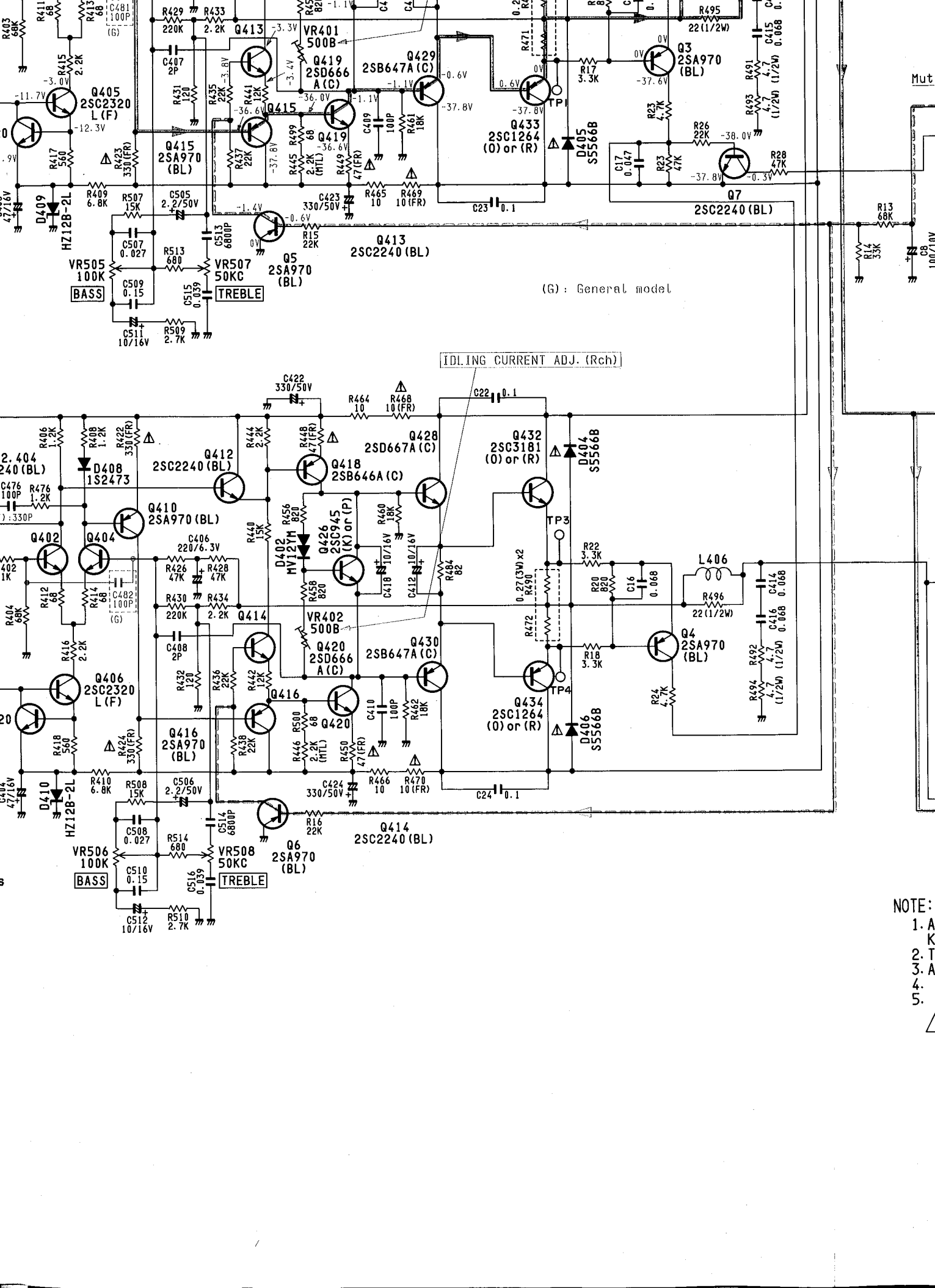


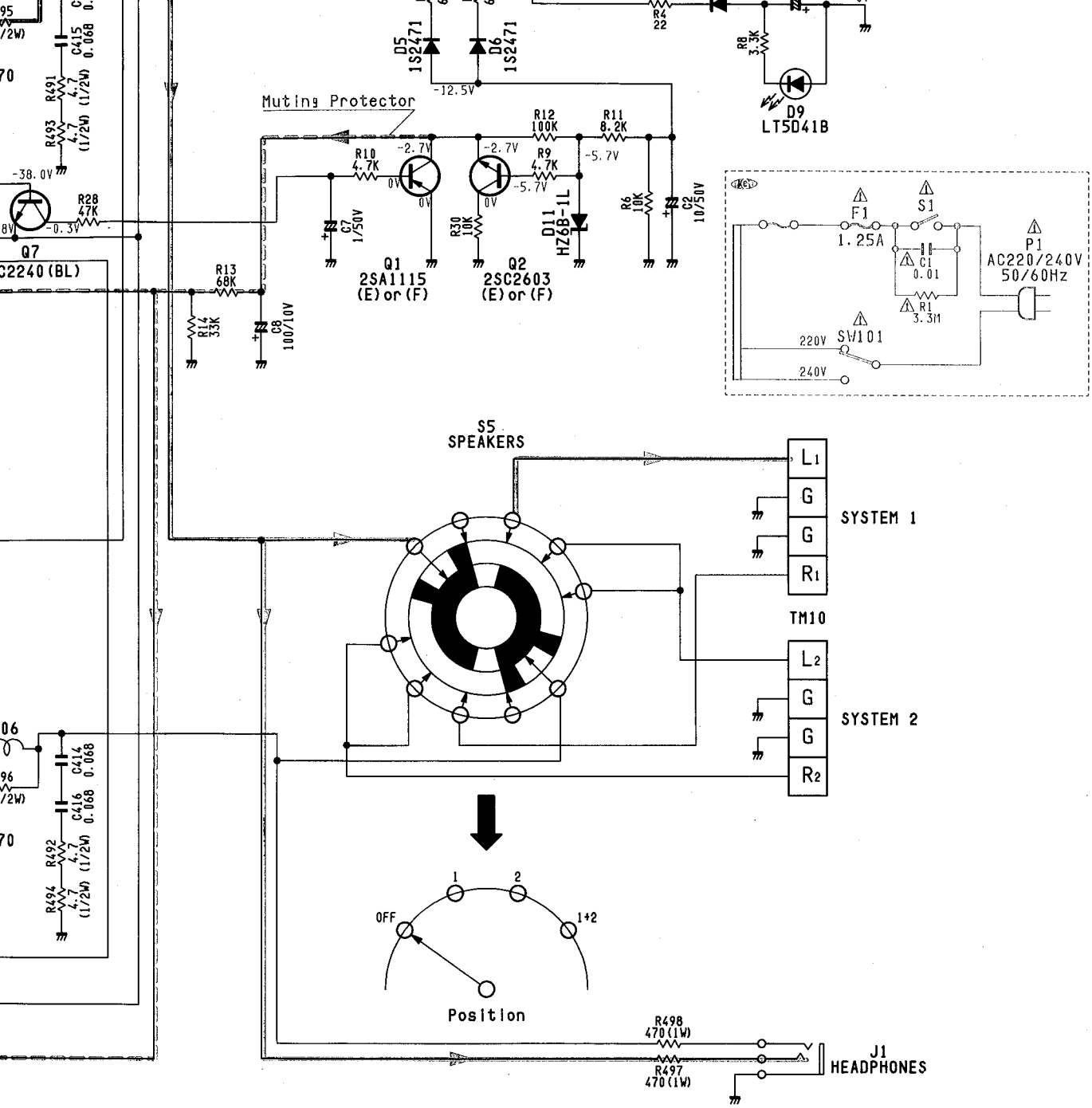

IDLING CURRENT ADJ. (Lch)
IDLING CURRENT ADJ. (Rch)
Q411 2SC2240(BL)
Q412 2SC2240(BL)
Q413 2SC2240(BL)
Q414
Q415 2SA970 (BL)
Q416 2SA970 (BL)
Q417 2SB646A(C)
Q418 2SB646A(C)
Q419 2SD666 A(C)
Q420 2SD666 A(C)
Q425 2SC945 (K) or (P)
Q426 2SC945 (K) or (P)
Q427 2SD667A(C)
Q428 2SD667A(C)
Q429 2SB647A(C)
Q430 2SB647A(C)
Q431 2SC3181 (O) or (R)
Q432 2SC3181 (O) or (R)
Q433 2SC1264 (O) or (R)
Q434 2SC1264 (O) or (R)
Q401
Q402
Q403
Q404
Q405 2SC2320 L(F)
Q406 2SC2320 L(F)
Q407 1S2473
Q408 1S2473
Q409 2SA970 (BL)
Q410 2SA970 (BL)
Q3 2SA970 (BL)
Q4 2SA970 (BL)
Q5 2SA970 (BL)
Q7 2SC2240(BL)
D401 MV12YM
D402 MV12YM
D403 S5566B
D404 S5566B
D405 S5566B
D406 S5566B
D409 HZ12B-2L
VR401 500B
VR402 500B
VR505 100K BASS
VR507 50KC TREBLE
TP1
TP2
TP3
TP4
L405
L406
EQ
RIAA
CN601
(G) : General model

J	K	L	M	N


37.8V
D1
D2
D3
D4
D1-4
ERC402FL
EQ
RIAA
CN601
C5 820/50V
C6 820/50V
C3 0.01
C4 0.01
-37.8V
T1
F1
2.5A
125V
(N)3.15A
S1
C1 0.01
SO1
P1
AC120V
60Hz
AC100V
50/60Hz
D8
1S2471
C10
10/16V
0V
R4
22
R8
3.3K
D9
LT5D41B
R31 6.8K
R32 6.8K
D5
1S2471
D6
1S2471
-12.5V
Muting Protector
R12
100K
R11
8.2K
R10
4.7K
R9
4.7K
-2.7V
-5.7V
0V
R6
10K
C2
10/50V
C7
1/50V
R30
10K
D11
HZ6B-1L
Q1
2SA1115
(E) or (F)
Q2
2SC2603
(E) or (F)
R13
68K
R14
33K
C8
100/10V
-38.0V
-0.3V
R28
47K
Q7
SC2240(BL)
405
970
406
R496
(1/2W)
R491
R493
R492
R494
4.7
(1/2W)
C413
C415
C414
C416
0.068
F1
1.25A
S1
C1
0.01
R1
3.3M
P1
AC220/240V
50/60Hz
SW101
220V
240V
S5
SPEAKERS
L1
G
G
R1
SYSTEM 1
TM10
L2
G
G
R2
SYSTEM 2
OFF
1
2
1+2


J5
TUNER
L
R
CD
L
R
VIDEO
L
R
R651 1K
R652 1K
C551 0.01
R653 1K
R654 1K
R655 1K
R656 1K
(G) 1K
J3
IN
TAPE 1
OUT
L
R
R561 1K
R562 1K
C552 0.01
R657 1K
C553 100P
C554 100P
R658 1K
(G)
J4
IN
TAPE 2
OUT
L
R
R563 1K
R564 1K
R659 1K
C555 100P
R660 1K
C556 100P
(G)
PHONO
S3
Function
TUNER
CD
VIDEO
BALANCE
VOLUME
VR501
50KM
VR503
100KB
R501 1K
C517 390P (G):220P
R571 27K
C575 180P
R573 4.7K
R575 27K
C577 0.082
R502 1K
C518 390P (G):220P
R572 27K
C576 180P
VR504
100KB
VR502
50KM
C578 0.082
R576 27K
R574 4.7K
OFF
ON
S8
Loudness
R419 68K
R403 68K
R411 68
R413 68
C481 100P (G)
R415 2.2K
-3.0V
-11.7V
Q405
2SC2320
L(F)
Q407
2SC2320
L(F)
-12.3V
-12.9V
R417 560
R423 330(FR)
C403 47/16V
R409 6.8K
D409
HZ12B-2L
VR505
100K
BASS
R406 1.2K
R408 1.2K
R422 330(FR)
Q402.404
2SC2240(BL)
D408
1S2473
C476 100P
R476 1.2K
(G):330P
C402 47/10V
Q402
Q404
R402 1K
R420 68K
R412 68
R414 68
C482 100P (G)
R404 68K
R416 2.2K
Q406
2SC2320
L(F)
Q408
2SC2320
L(F)
R418 560
R424 330(FR)
C404 47/16V
D410
HZ12B-2L
R410 6.8K
VR506
100K
BASS

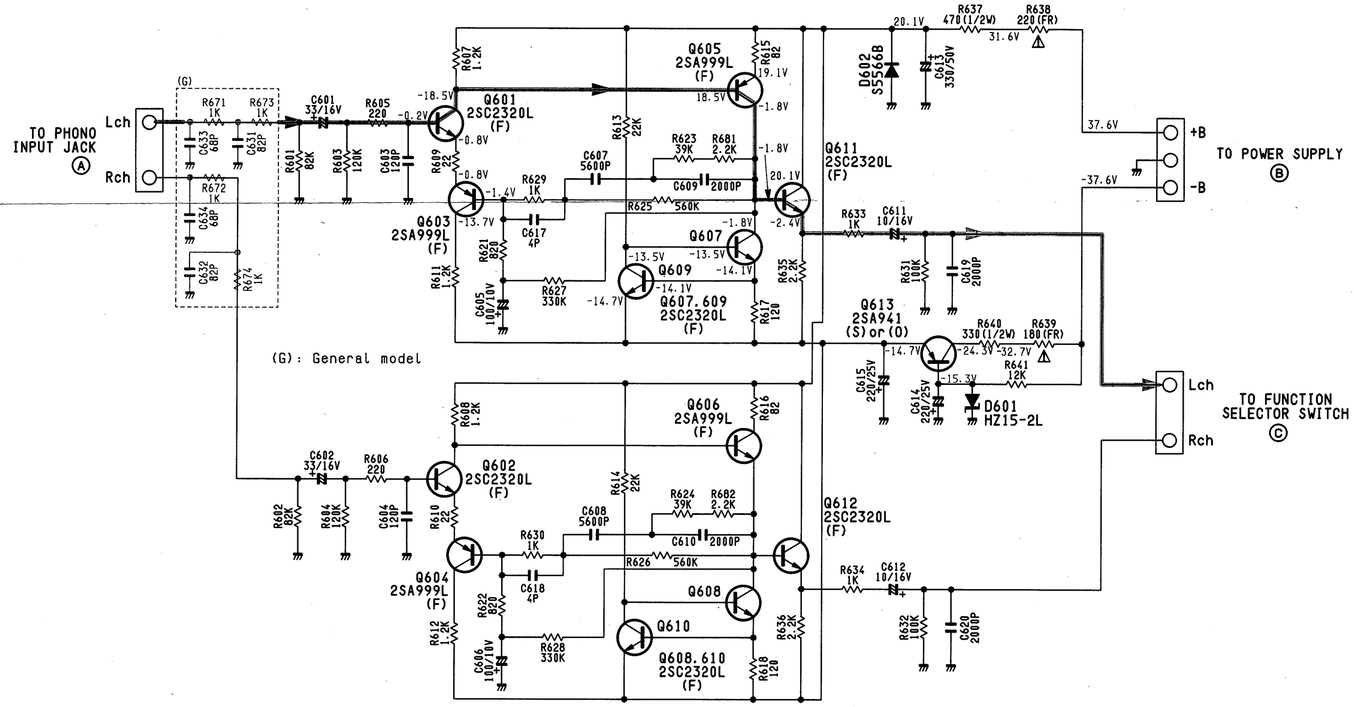

IDLING CURRENT ADJ. (Rch)
(G) : General model
Q405 2SC2320 L(F)
Q415 2SA970 (BL)
Q409 HZ12B-2L
Q413 2SC2240(BL)
Q5 2SA970 (BL)
Q433 2SC1264 (O) or (R)
Q3 2SA970 (BL)
Q7 2SC2240(BL)
D405 S5566B
VR505 100K BASS
VR507 50KC TREBLE
Q412 2SC2240(BL)
D408 1S2473
Q410 2SA970(BL)
Q402
Q404
Q406 2SC2320 L(F)
Q416 2SA970 (BL)
D410 HZ12B-2L
Q414 2SC2240(BL)
Q6 2SA970 (BL)
Q428 2SD667A(C)
Q418 2SB646A(C)
Q426 2SC945 (K) or (P)
D402 MV12YM
Q432 2SC3181 (O) or (R)
D404 S5566B
Q420 2SD666 A(C)
Q430 2SB647A(C)
Q434 2SC1264 (O) or (R)
D406 S5566B
VR506 100K BASS
VR508 50KC TREBLE
L406
Q4 2SA970 (BL)
TP1
TP3
TP4
NOTE:
1. A
K
2. T
3. A
4.
5.



NOTE:

1. ALL RESISTANCES VALUES ARE IN Ω.
   KΩ=1000Ω, MΩ=1000KΩ.
2. THE WATTAGE OF RESISTORS IS 1/4W UNLESS OTHERWISE NOTED.
3. ALL CAPACITANCES VALUES ARE IN μF UNLESS OTHERWISE NOTED. P=μμF.
4. ...V:DC VOLTAGE AT NO SIGNAL UNLESS OTHERWISE NOTED.
5. ⚠ SAFETY REQUIREMENTS COMPONENTS IN ACCORDANCE WITH PRESENT SAFETY REGULATIONS. THESE COMPONENTS MUST ONLY BE REPLACED BY ORIGINAL PARTS.

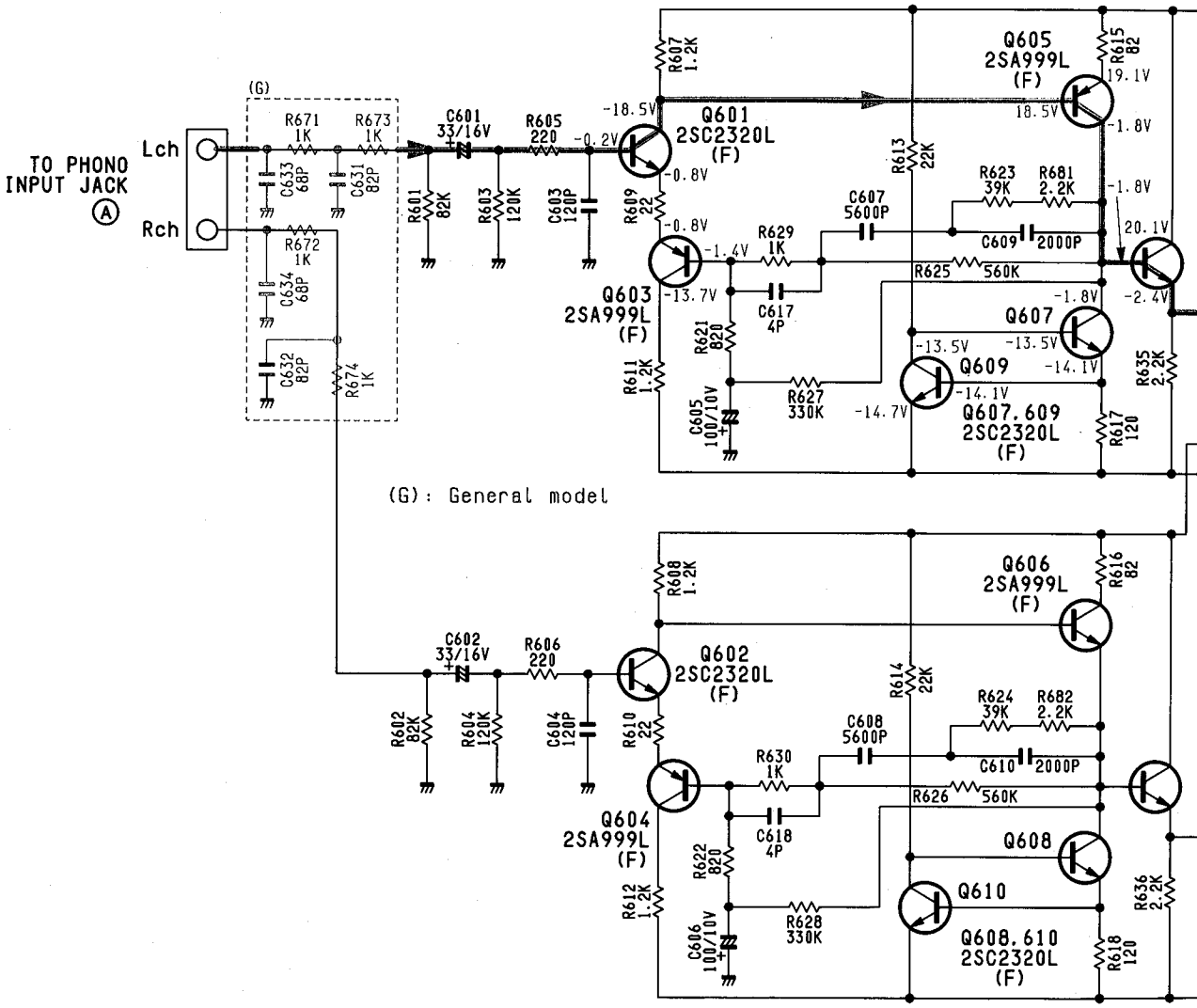
SCHEMATIC DIAGRAM



NOTE:

1. ALL RESISTANCES VALUES ARE IN Ω.
   KΩ=1000Ω, MΩ=1000KΩ.
2. THE WATTAGE OF RESISTORS IS 1/4W UNLESS OTHERWISE NOTED.
3. ALL CAPACITANCES VALUES ARE IN μF UNLESS OTHERWISE NOTED. P=μμF.
4. ...V:DC VOLTAGE AT NO SIGNAL UNLESS OTHERWISE NOTED.
5. ⚠ SAFETY REQUIREMENTS COMPONENTS IN ACCORDANCE WITH PRESENT SAFETY REGULATIONS, THESE COMPONENTS MUST ONLY BE REPLACED BY ORIGINAL PARTS.

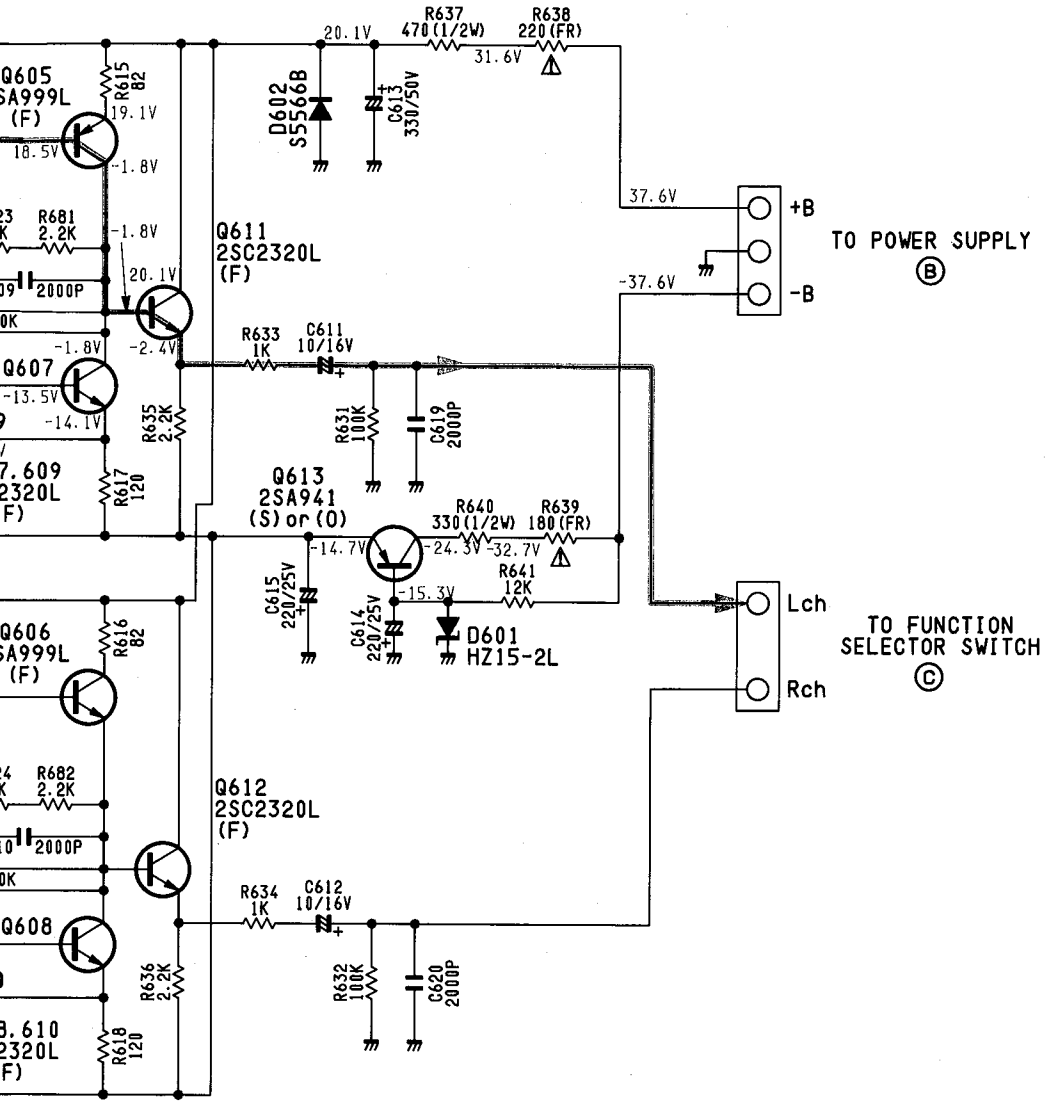
SCHEMATIC DIAGRAM

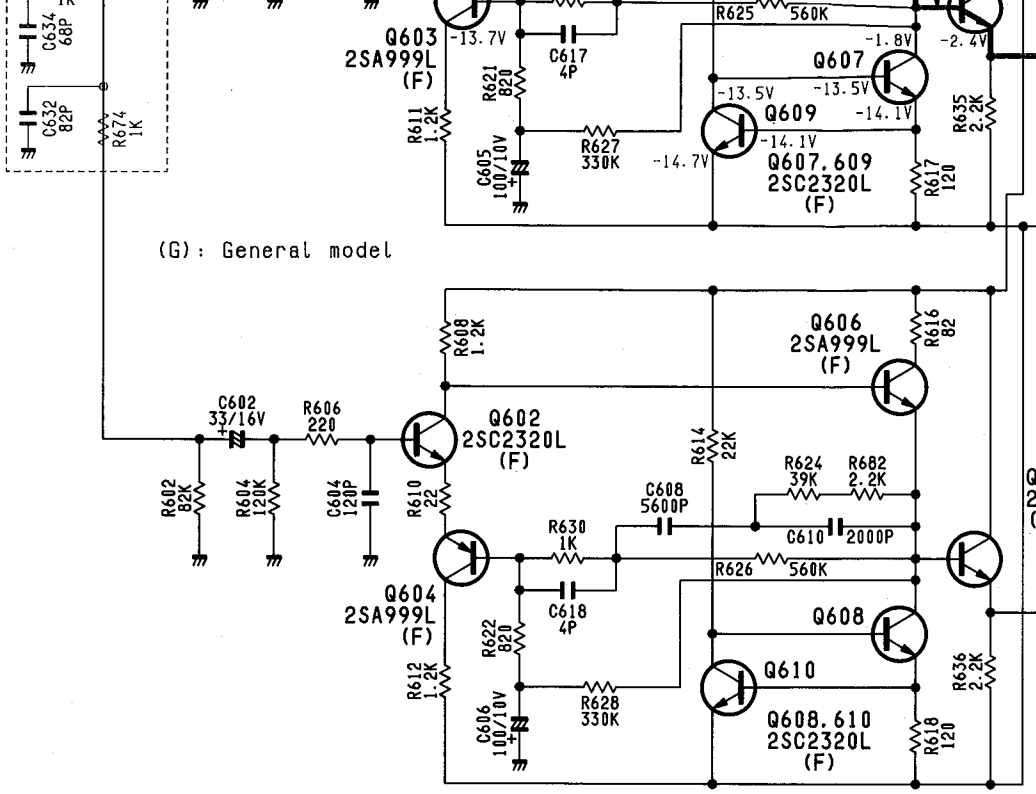


(G): General model

NOTE:

1. ALL RESISTANCES VALUES ARE IN Ω.
   KΩ=1000Ω, MΩ=1000KΩ.
2. THE WATTAGE OF RESISTORS IS 1/4W UNLESS OTHERWISE NOTED.
3. ALL CAPACITANCES VALUES ARE IN μF UNLESS OTHERWISE NOTED. P=μμF.
4. ...V:DC VOLTAGE AT NO SIGNAL UNLESS OTHERWISE NOTED.
5. ⚠ SAFETY REQUIREMENTS COMPONENTS IN ACCORDANCE WITH PRESENT SAFETY REGULATIONS. THESE COMPONENTS MUST ONLY BE REPLACED BY ORIGINAL PARTS.


R637
470(1/2W)
R638
220(FR)
20.1V
31.6V
D602
S5566B
C613
330/50V
37.6V
+B
TO POWER SUPPLY
B
-37.6V
-B
Q605
SA999L
(F)
R615
82
19.1V
18.5V
-1.8V
R681
2.2K
2000P
Q611
2SC2320L
(F)
20.1V
-2.4V
R633
1K
C611
10/16V
Q607
-13.5V
-14.1V
R635
2.2K
R631
100K
C619
2000P
R617
120
Q613
2SA941
(S)or(O)
R640
330(1/2W)
R639
180(FR)
-14.7V
-24.3V
-32.7V
R641
12K
-15.3V
C615
220/25V
C614
220/25V
D601
HZ15-2L
Lch
Rch
TO FUNCTION
SELECTOR SWITCH
C
Q606
SA999L
(F)
R616
82
R682
2.2K
2000P
Q612
2SC2320L
(F)
R634
1K
C612
10/16V
Q608
R636
2.2K
R632
100K
C620
2000P
R618
120



NOTE:

1. ALL RESISTANCES VALUES ARE IN Ω.
   KΩ=1000Ω, MΩ=1000KΩ.
2. THE WATTAGE OF RESISTORS IS 1/4W UNLESS OTHERWISE NOTED.
3. ALL CAPACITANCES VALUES ARE IN μF UNLESS OTHERWISE NOTED. P=μμF.
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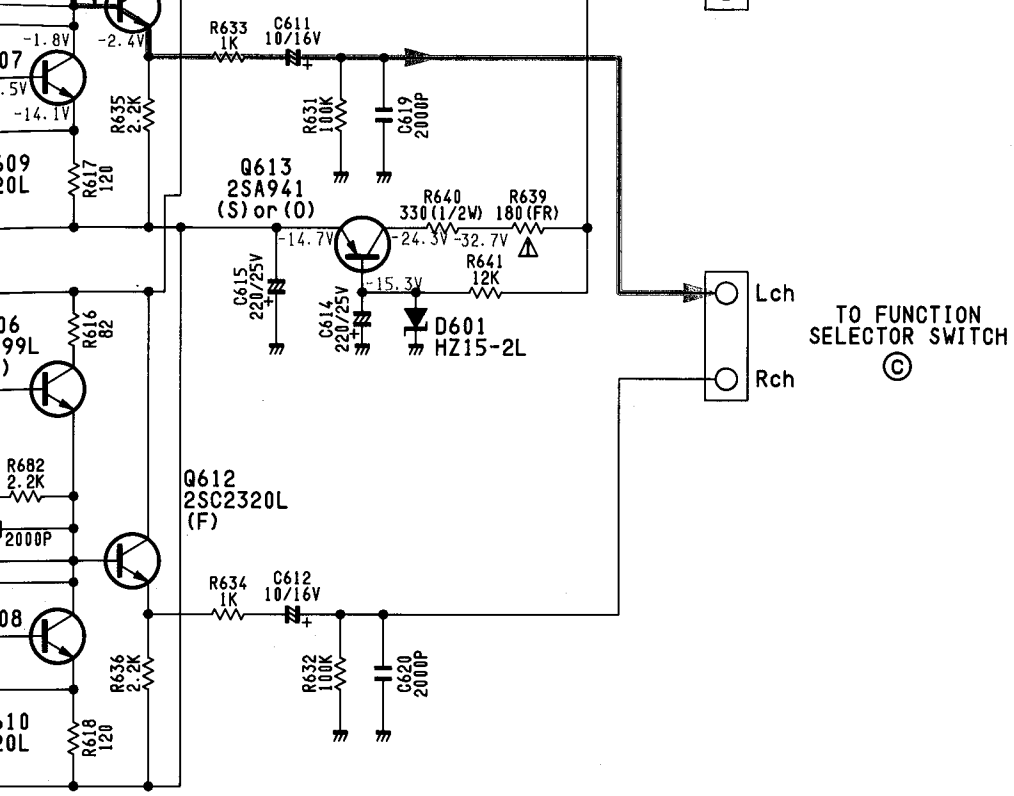
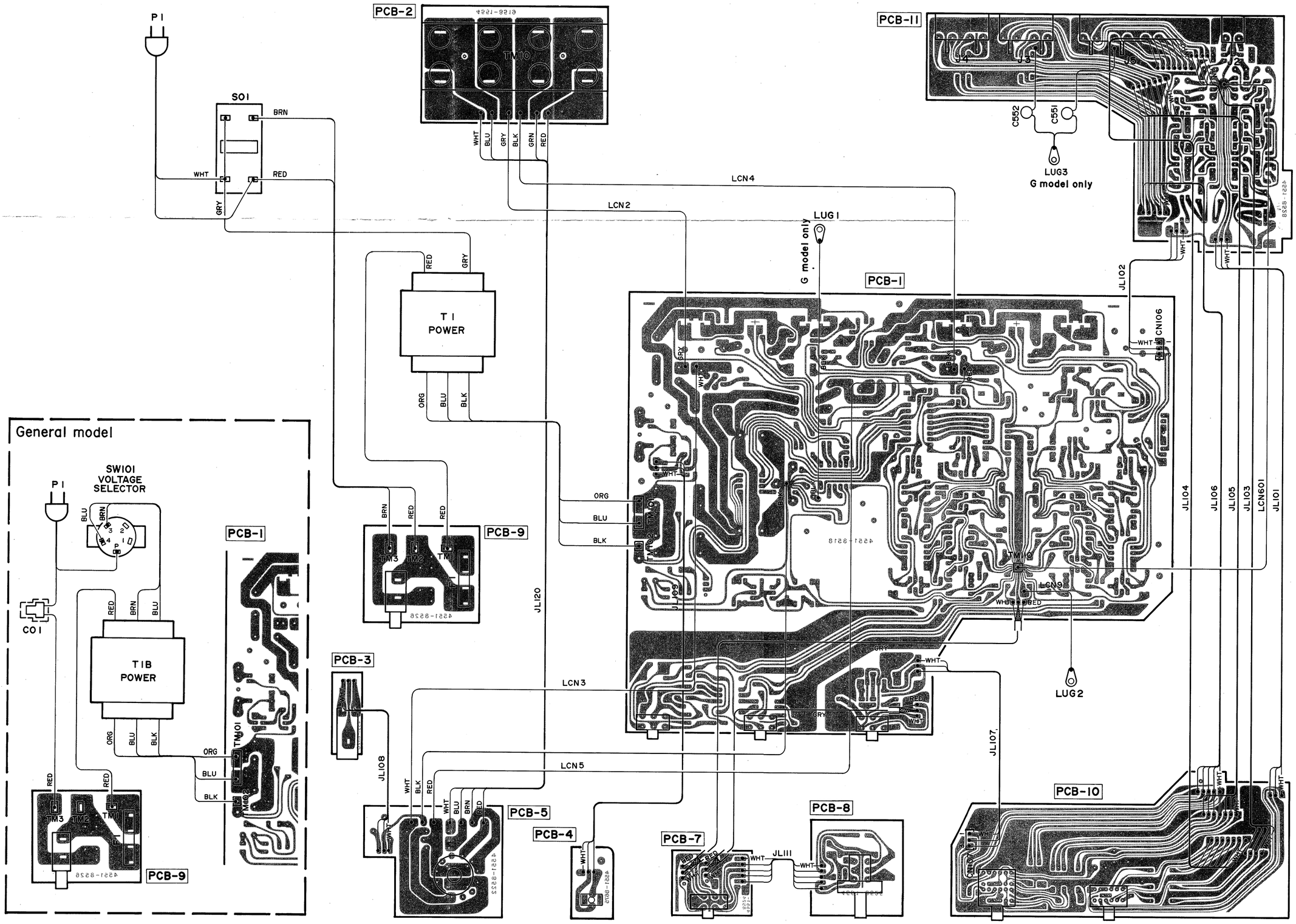

R633
1K
C611
10/16V
R631
100K
C619
2000P
R635
2.2K
R617
120
Q613
2SA941
(S) or (O)
R640
330(1/2W)
R639
180(FR)
-14.7V
-24.3V
-32.7V
-15.3V
R641
12K
C615
220/25V
C614
220/25V
D601
HZ15-2L
Lch
Rch
TO FUNCTION
SELECTOR SWITCH
©
R616
82
R682
2.2K
Q612
2SC2320L
(F)
R634
1K
C612
10/16V
R632
100K
C620
2000P
R636
2.2K
R618
120
-1.8V
-2.4V
-14.1V

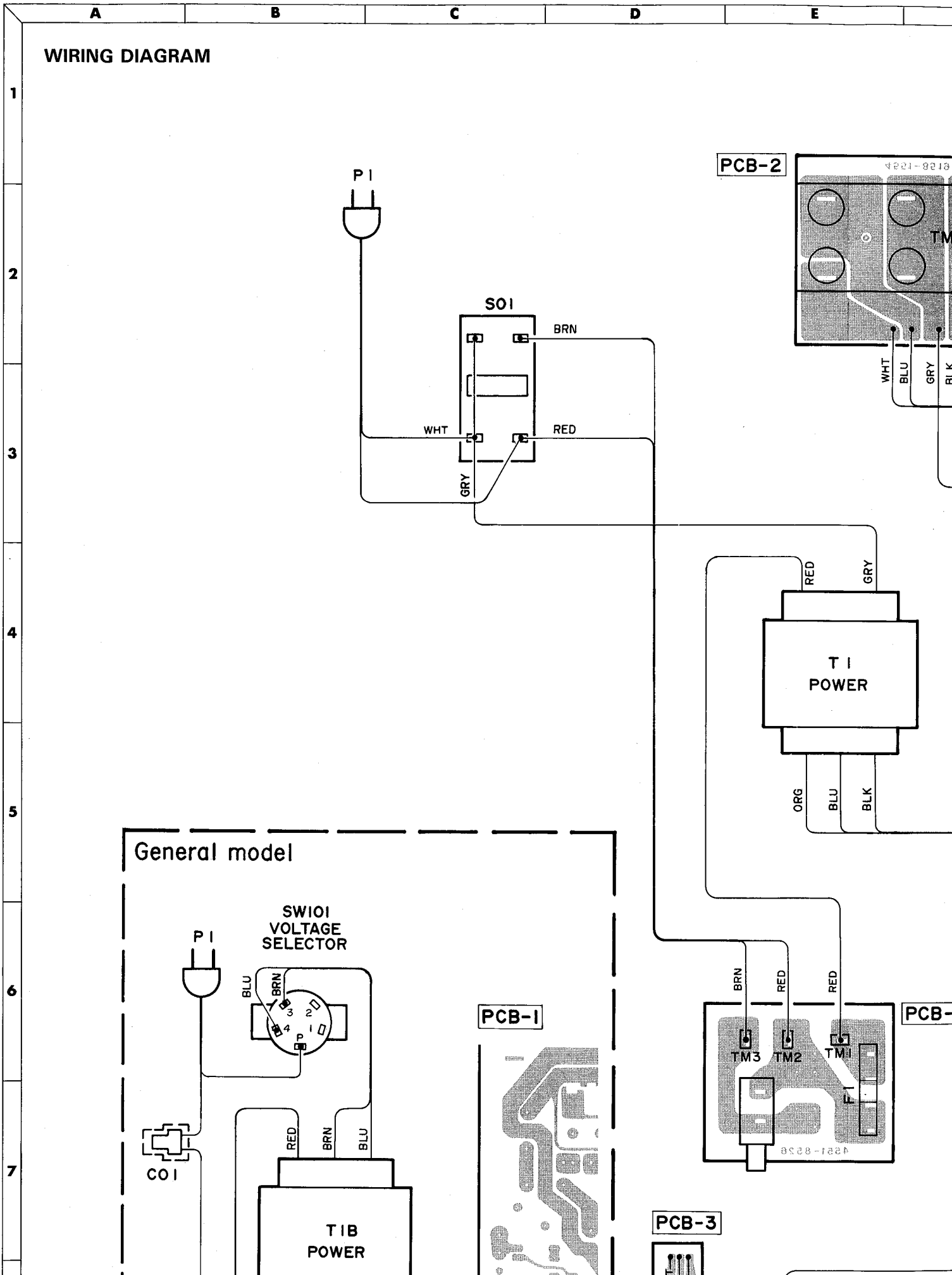
WIRING DIAGRAM



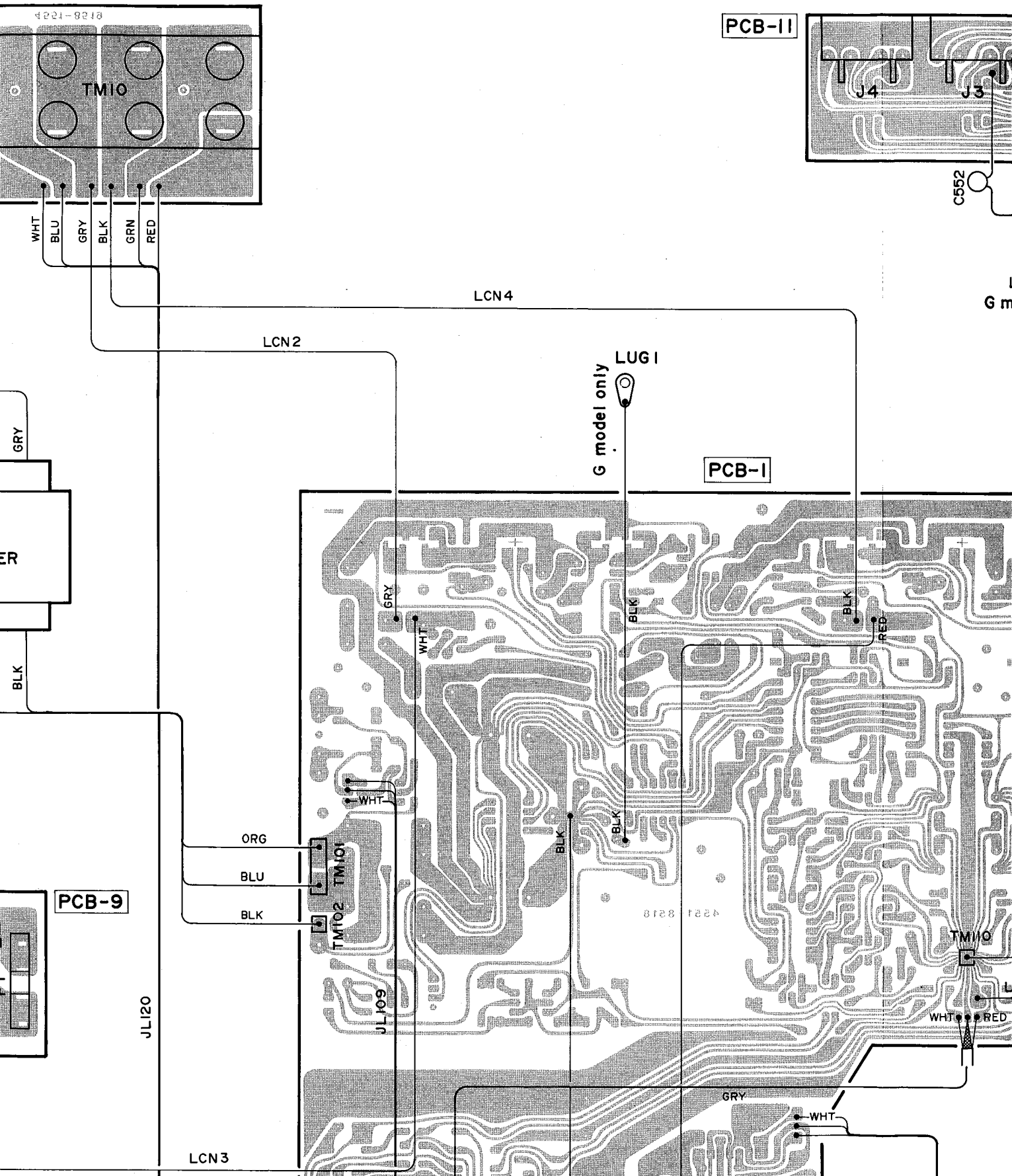
WIRE COLOR ABBREVIATIONS

RED	: Red	YEL	: Yellow
ORG	: Orange	PUP	: Purple
BLU	: Blue	PIK	: Pink
WHT	: White	GRY	: Gray
GRN	: Green	BRN	: Brown
BLK	: Black		

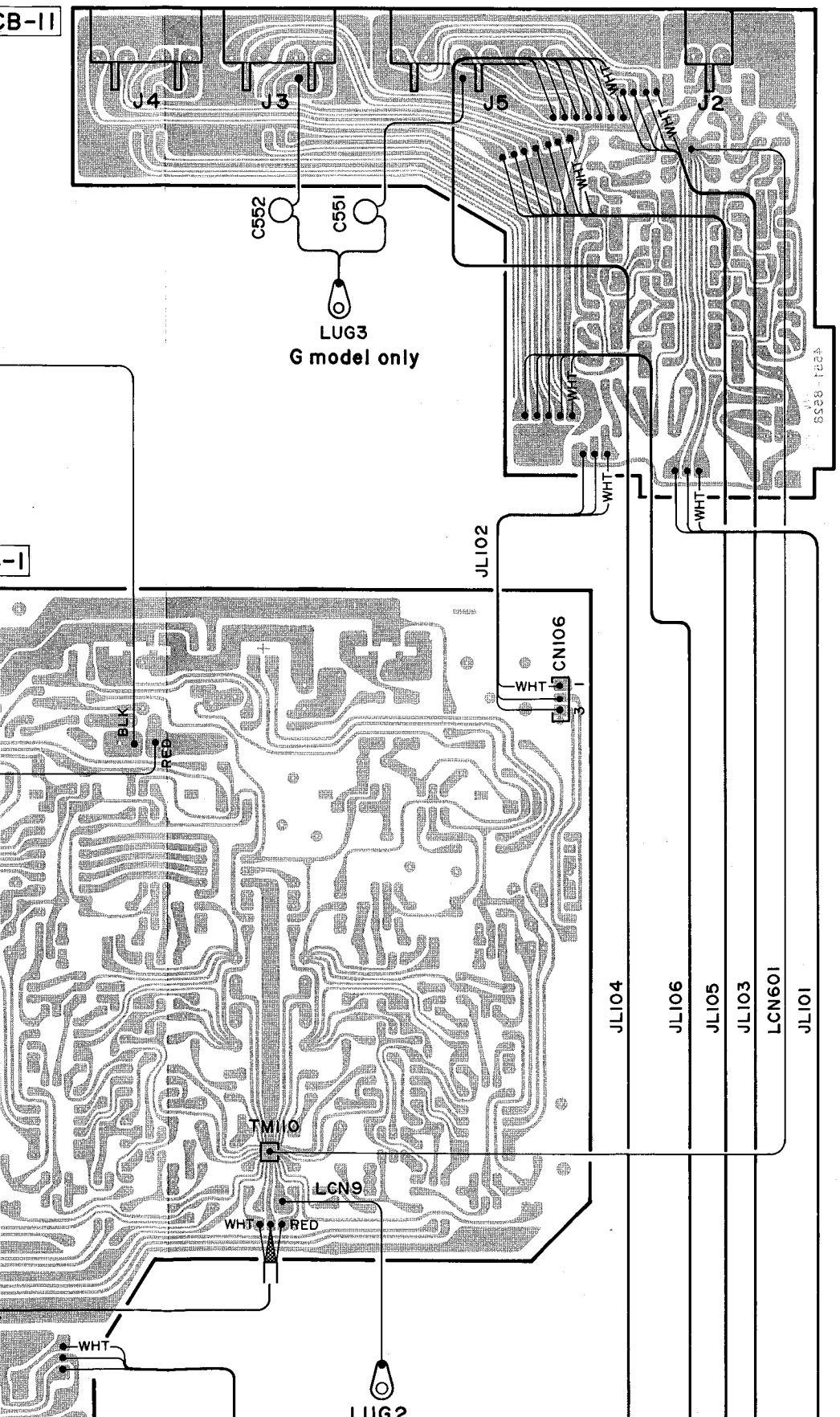
WIRING DIAGRAM

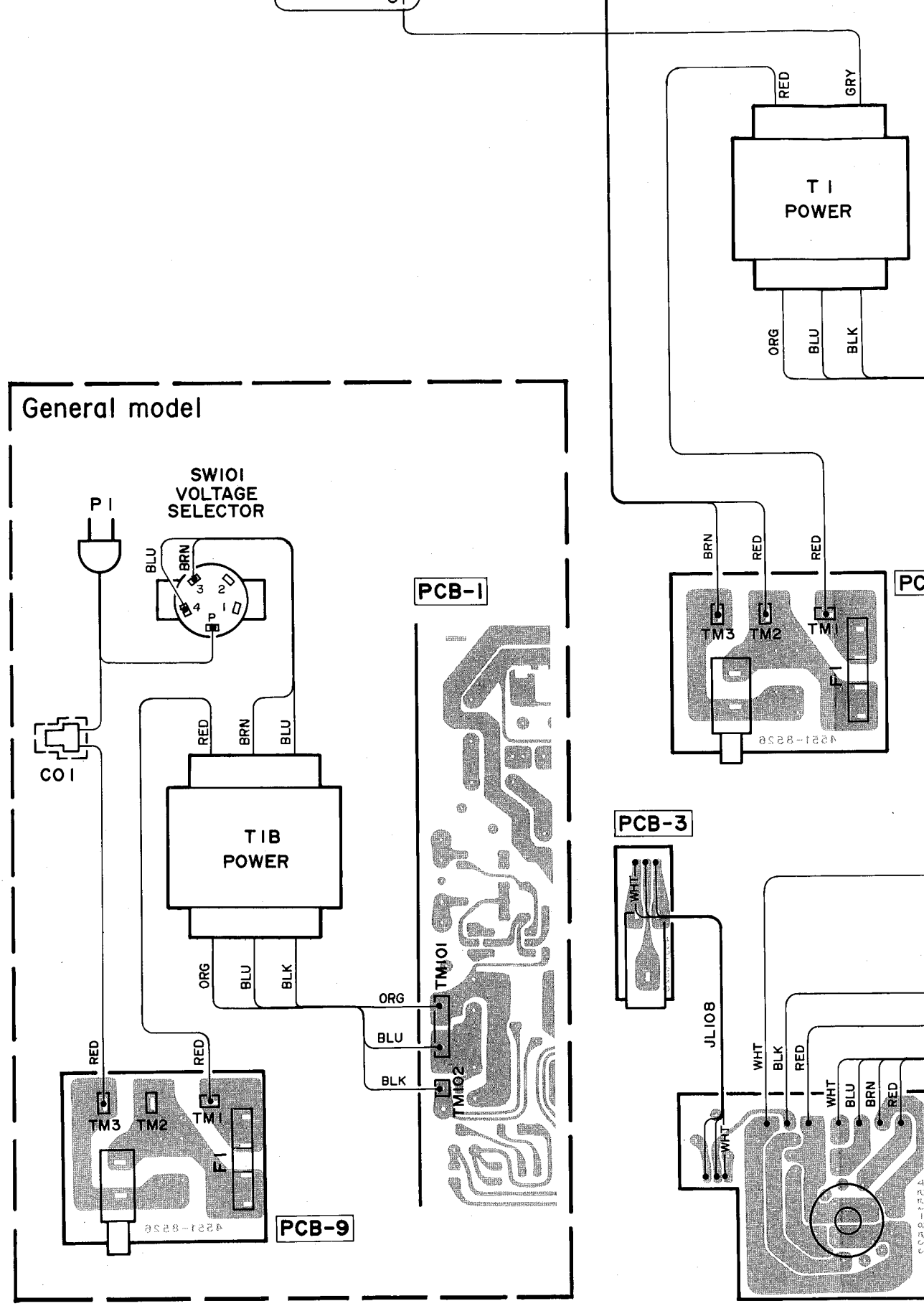


F G H I J


TM10
WHT
BLU
GRY
BLK
GRN
RED
PCB-11
J4
J3
C552
LCN4
LCN2
LUG1
G model only
PCB-1
GRY
WHT
BLK
BLK
RED
WHT
BLK
BLK
ORG
BLU
BLK
TM101
TM102
PCB-9
JL109
JL120
TM110
WHT
RED
GRY
WHT
LCN3

J K L M N


CB-II
J4
J3
J5
J2
C552
C551
LUG3
G model only
WHT
JL102
CN106
BLK
RED
JL104
JL106
JL105
JL103
LCN601
JL101
TM110
LCN9
WHT
RED
LUG2



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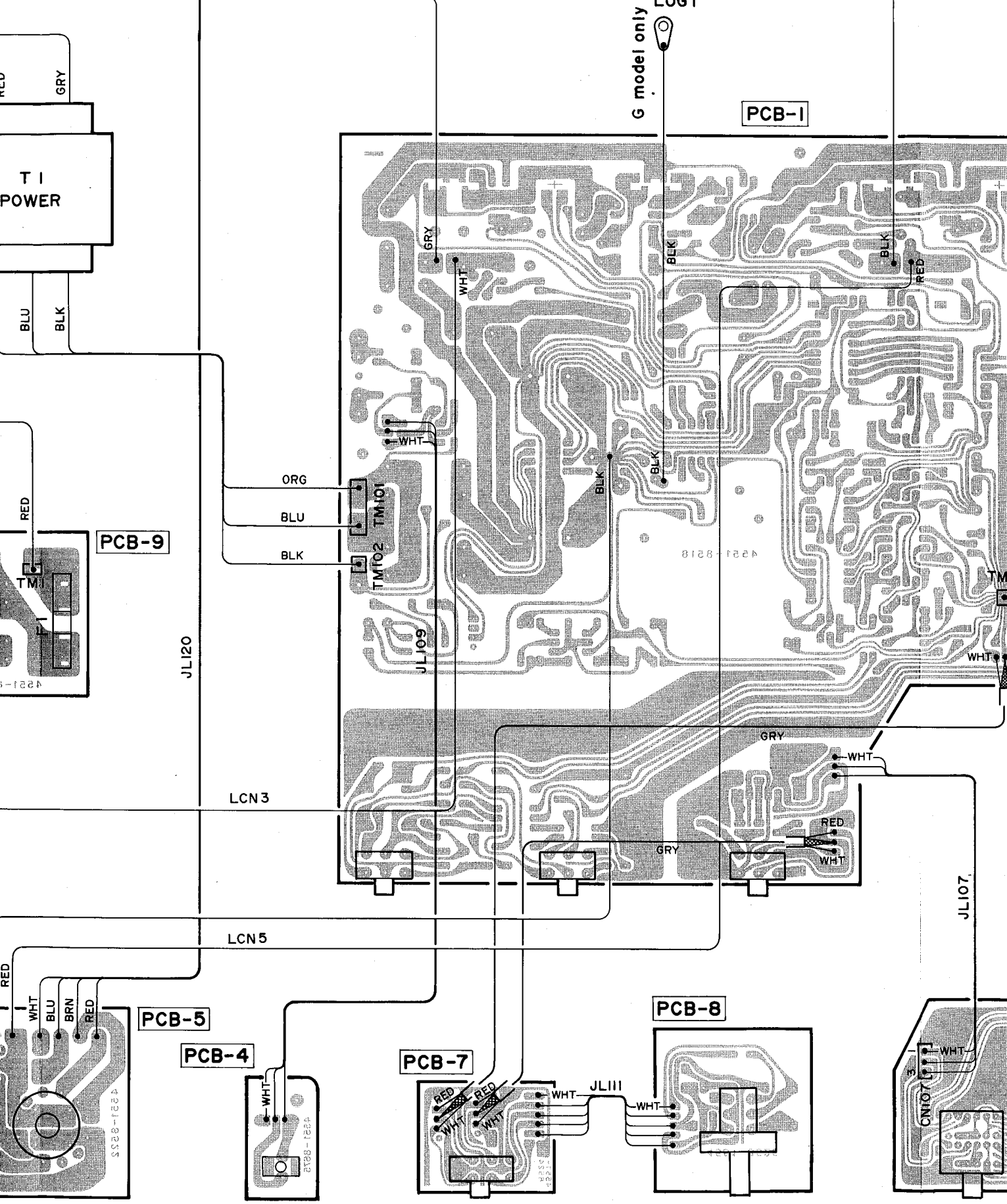
T1
POWER
GRY
BLU
BLK
RED
PCB-9
TM1
F1
JL120
ORG
BLU
BLK
TM102
TM101
JL109
WHT
BLK
BLK
PCB-1
GRY
WHT
BLK
BLK
RED
WHT
GRY
WHT
RED
GRY
WHT
LCN3
LCN5
JL107
RED
WHT
BLU
BRN
RED
PCB-5
PCB-4
WHT
PCB-7
RED
RED
WHT
WHT
WHT
JL111
PCB-8
WHT
CN107
WHT
G model only
LOGT

JL102
CN106
WHT
BLK
RED
JL104
JL106
JL105
JL103
LCN601
JL101
TM110
LCN9
WHT
RED
WHT
LUG2
RED
WHT
JL107
PCB-10
WHT
CN107
WHT
WHT
WHT
WHT
WHT
WHT